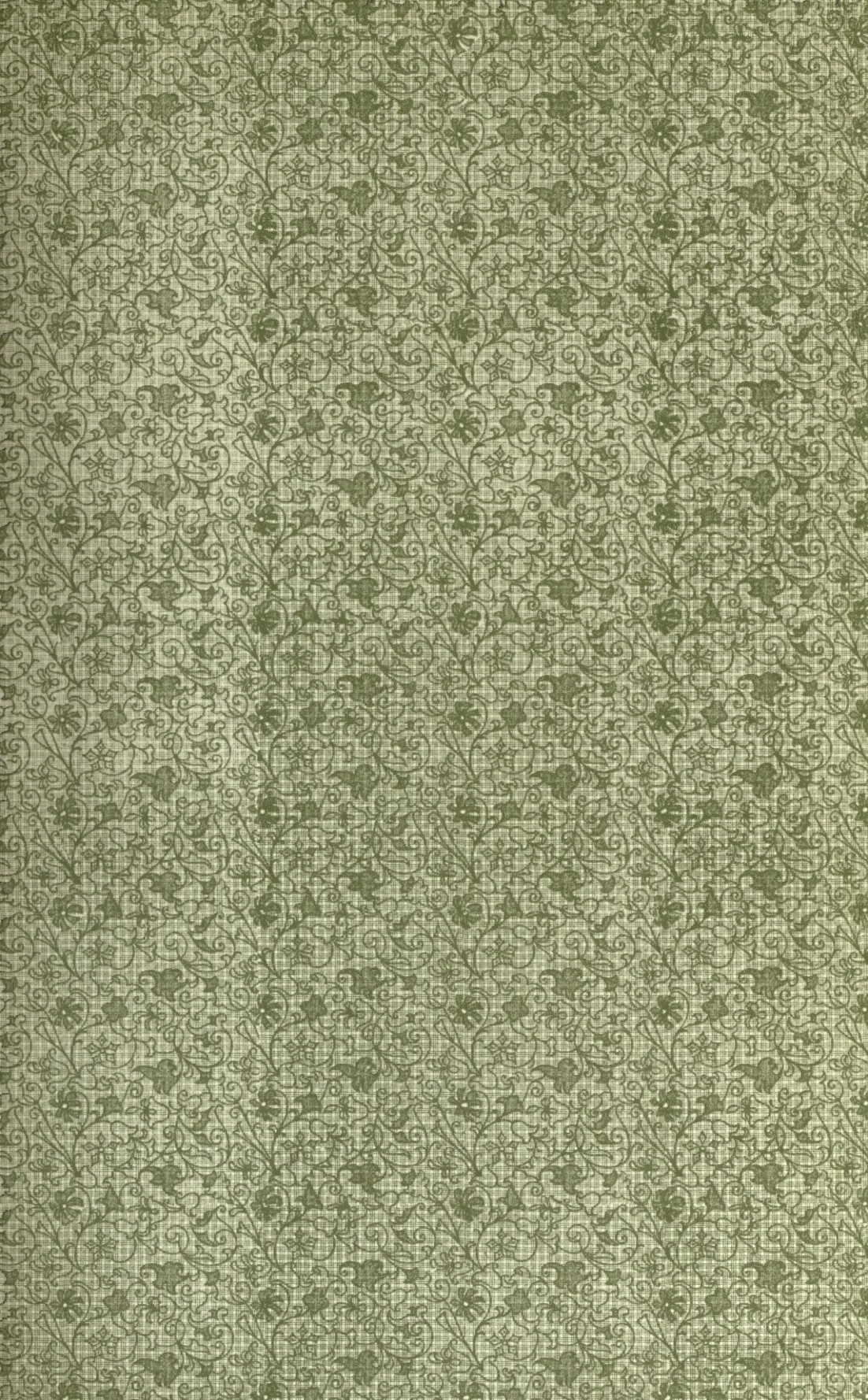






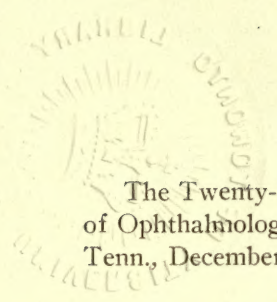
TRANSACTIONS
OF THE
TWENTIETH ANNUAL MEETING

OF THE

American
Academy of Ophthalmology
and Oto-Laryngology

HELD AT
CHICAGO, ILL.,
OCTOBER 5, 6, 7, 1915

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The Twenty-First Annual Meeting of the American Academy
of Ophthalmology and Oto-Laryngology will be held at Memphis,
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THE PRESIDENT'S ADDRESS

RELATION OF OTOLARYNGOLOGY TO OTHER SPECIALTIES—TEAM WORK

JOSEPH C. BECK, M.D.

CHICAGO

In looking over the addresses of my predecessors for the past few years, I find that the subjects of the evolution and progress of the Academy have been most excellently covered and therefore have we, the chairman of the Ophthalmological section and myself, decided on a different topic, one similar to that by Dr. Derrick T. Vail and myself in 1911, as chairmen of the otolaryngological section. We wish to speak about the relation of ophthalmology and otolaryngology to the various other specialties and I desire to confine my remarks to the latter, namely, otolaryngology, and other branches of medicine.

The various specialties that may be classed as such and are recognized by the various associations on pedagogy are divided into: (a) surgical; (b) nonsurgical; (c) mixed or associated. In the surgical division we have: 1. General surgery. 2. Gynecology and obstetrics. 3. Genito-urinary. 4. Ophthalmology. 5. Otolaryngology.

Such subdivisions as orthopedic surgery, nervous surgery, gastro-intestinal or upper abdominal surgery, plastic and cosmetic surgery, oral surgery, etc., are all subdivisions of any or all of the five surgical branches named above.

Under the head of nonsurgical specialties are: 1. General medicine. 2. Pediatrics. 3. Neurology. 4. Skin and venereal diseases.

Again, the subdivision of psychiatry, electrotherapeutics, hygiene and preventive medicine, etc., are subdivisions belonging to any one of the medical or nonsurgical branches.

Under the mixed or associated specialties and yet independent are: 1. Roentgenology. 2. Pathology.

The development of these special fields has led to such tremendous increase of information and literature, that it is no more possible to be a thorough general practitioner, that is, to be thoroughly trained and posted in all the branches of medicine,

and therefore all one should expect of a general practitioner is a very superficial knowledge, except in the most important diseases and in these, a proficiency in the diagnosis and prevention of complications. The specialization has perhaps gone to the other extreme in some instances, so we find in our own special field one man will treat only the ear and perhaps only a certain limited number of its diseases. I know of a splendid otologist who pretends to confine himself to operation on the mastoid process and intracranial complications, and you all know Chevalier Jackson, who, however, must not be classed as having gone to the extreme, confines his work to laryngobronchoscopy and all that this special field comprises.

In taking up the various specialties mentioned, and their relation to otolaryngology, I shall mention examples of conditions where both specialties meet and frequently require one another's opinion and assistance in the diagnosis and treatment.

General Surgery.—In my address before this Academy as chairman of the Otologic Section entitled "Limitations of Otolaryngologic Practice," I cited a number of the conditions which were at that time and to some extent are still treated by the general surgeon. I cited the reasons why they should be managed by the otolaryngologist rather than the general surgeon, and I am happy to note the marked increase in the work of border-line surgery by otolaryngologists, and the corresponding acquiescence on the part of the general surgeon, that such is the work of the otolaryngologist. Several such articles have appeared since then, from the pens of our ranks, of whom Barnhill, Cott and Makenty should be mentioned. Last year I presented before the Pennsylvania and Indiana State Medical Associations a similar topic, namely, "Borderline Surgery," and found an entirely different attitude on the part of the otolaryngologists than when I first presented it to them; that is, they were much more favorable toward adopting the proposition.

Intracranial Complications.—With the marked improvement in the diagnosis and surgical technic of intracranial conditions it is the otolaryngologist and not the general surgeon who is most frequently called in consultation in such cases. Of course if a general surgeon becomes a specialist in surgery of the cerebro-spinal nervous system, then such a man is considered particularly qualified to do that work. He is, nevertheless, handicapped, because in the case of brain abscess or meningitis it is the original focus, like the mastoid or nasal accessory sinuses, that must receive either simultaneous or subsequent attention. Again, in

cases of brain tumor, particularly of the pontine cerebellar variety, the auditory nerve or hypophyseal gland are conditions which have a close relation with the work of the otolaryngologist. Fractures of the skull have very many times symptoms referable to these special organs so that an otolaryngologist should be prepared to handle such conditions. The rarer pathologic malformations of the skull such as macrocephalus and microcephalus, hydrocephalus and oxycephalus, all have symptoms referable to the special organs. There is much work to be done along these lines, because the surgeons have neglected in a measure to develop the diagnosis and special treatment that has been made in other brain conditions.

Glands.—Diseased glands of the neck are recognized by all general men to be due to some chronic focus of infection about the nose, throat and mouth, and, consequently here, too, is the otolaryngologist called to determine the facts.

Goiter.—Since the goiter frequently causes difficulty in breathing, swallowing and speaking it is not infrequent that these cases are first referred to the otolaryngologist; and, since headache is one of the annoying symptoms of exophthalmic goiter it is very often that an otolaryngologist is consulted only to find that a diseased thyroid gland is at fault.

Tongue.—Diseases of the tongue, such as tuberculosis, abscess and neoplasms, have for a long time been under the management of the general or oral surgeon. Yet, Butlin and Brunung have shown that the laryngologist is the logical specialist to take care of these conditions, since they are accustomed to work in the mouth and the ultimate results as to speech and deglutition are well understood by them.

Cleft palate, harelip, surgical diseases of the jaws and the salivary apparatus are numerous recorded in laryngologic literature as having been successfully managed as to warrant their addition to our specialty.

Plastic surgery of the nose and ears is now described more or less in every modern text book on otolaryngology. Malignant diseases of the neck have invariably their origin in the mouth, throat, or particularly the larynx, and must have the laryngologist to determine that fact. It stands to reason that he will be able to take care of both the internal as well as the external condition from a surgical point of view.

In the *orthopedic* department we recognize an upper Potts disease or other forms of curvature to the cervical vertabrae, and these conditions frequently manifest themselves either as a

swelling within the throat or referred pains to the head and neck and paralysis of other cranial nerves. I have had a very rare condition of the cervical portion of the vertebral column known as spondylolisthesis (sliding of the vertebral bodies) which produced pressure or traction on the posterior nerve root causing great pain along the occipital branches of the cervical plexus. It becomes necessary to resect these roots according to the method of Foerster, after obtaining temporary relief from alcohol injections.

One will see from this analysis that an otolaryngologist becomes a head and neck surgeon, and that is what I believe he should be in order to bring about progress which will be beneficial both to the profession and patient.

A frequent association with a general surgeon is in operating a general and otolaryngological condition at the same time so as to save the patient two anesthetics and prolonged stay in the hospital. This proposition has occurred to me very frequently, and I desired to have the expression of others along this line. I therefore presented a paper at our state meeting several years ago, based upon my own experience, entitled "Combination Operation." I then expressed myself and am still of the same opinion that I do not consider it good practice, because it makes the operation more difficult, often times for both operators and when complications develop one cannot always judge whether they are due to one or the other operation. If, however, this combination operating cannot be avoided, then it is better to insist upon operating either first or last, which may prolong the anesthetic but makes it easier.

It also happens occasionally that some general surgical condition develops, that is, appendicitis, etc., during the convalescence or treatment of an otolaryngological condition, and it is very necessary that the otolaryngologist be able to recognize such conditions; and, vice versa, the general surgeon will be alert to otolaryngologic conditions during the care of his patient.

It is not necessary to go any farther into details of the manifold circumstances which will bring the general surgeon and otolaryngologist together. It is, however, a comfort to me, as it should be to every otolaryngologist, of the progress in our surgical field and the recognition we have received from the general surgeon. I am reminded of the words of Senn, when I told him that I would give up general surgery and become an otolaryngologist: "I recognize that specialty to be made up of the most proficient blowers and sprayers in the profession." "Blowers"

referring to the Politzeration. I had the greater pleasure to hear him say shortly before he died that "our specialty was making the greater strides of any in the surgical field."

GYNECOLOGY, OBSTETRICS AND GENITO-URINARY

In these three special surgical specialties there are seldom conditions that arise in which the otolaryngologist is very much concerned, or vice versa. However, I would like to call attention to the manifold nervous symptoms which are referable to the uterus. I particularly refer to the vasomotor changes of the erectile tissue of the turbinates and the irritation spots on the septum associated with dysmenorrhea.

The question of chronic focal infection associated with these in the nose, throat, teeth and ear, have proved to be of considerable interest in these surgical fields. Genito-urinary men have called attention to the secondary infections of the kidney, bladder and prostate from tonsillar infections.

Ophthalmology.—We all understand the intimate relationship of these two specialties; and, as the chairman of the Ophthalmological Section is to present this phase of the subject, I will content myself with the remark that I cannot see how it is possible to practice otolaryngology satisfactorily without a working knowledge of ophthalmology and vice versa.

Dentistry.—The history of the association of dentistry and otolaryngology is very interesting. We find that at one time it was part of the curriculum of the school of general medicine, but subsequently became an independent branch which it still is at the present time. Nevertheless during the past two years, there has been a wide enthusiasm on the part of the dentist as well as the medical men, especially in our line, of a very close interdependence, so we find that this specialty cannot be very well divided from general medicine. I am cognizant of the fact that the dental profession feels the same way. One of the greatest questions for both the dentist and otolaryngologist is the matter of chronic focal infection from apical areas. The question of pyorrhea alveolaris, assuming that the responsibility is from the etiological factor as to the continuity of structures, is not a new one, but one to be well borne in mind.

B. NONSURGICAL

Medicine.—In regard to the medical branches, we find that diagnosis is perhaps the most frequent ground of contact between the internist and the otolaryngologist. One can take a textbook

on internal medicine and begin systematically with every disease and find the mention of symptoms referable to otolaryngology, in fact in many it may be the only ones that require the greatest attention. Again, one may take a textbook on otolaryngology and find a great many diseases there discussed which have general symptoms that must be recognized and treated. What should be the attitude of these specialties to each other? Should the internist call a specialist to treat a nose bleed in typhoid fever or leukemia or tinnitus aureum in a severe anemia or plethora, a sore throat in a pneumonia, etc.; and, should an otologist call an internist to treat a pneumonia associated with a case of sinus thrombosis or the secondary anemia as a result of a nasal operation in which there occurred bleeding? These are questions which I shall answer when I consider the subject of team work. I may say right here, however, that it is most difficult to draw a sharp line as to the limitations of these special branches.

Pediatrics.—This specialty is in reality nothing more than a subdivision of internal medicine, in that the pediatrician confines his work to the infant and child. Consequently what I have said in regard to internal medicine applies to it also. It so happens, however, that a great deal of otolaryngological work occurs in children and it must be acknowledged, at least at this time, that the pediatrician has not kept pace with the development of the more modern otolaryngologic subjects as have other special branches. The pediatricians have a tendency to procrastinate or treat conditions with which they have no greater knowledge and training than a general practitioner; I refer particularly to the management of complications in the exanthemata of the nasal accessory sinuses and middle ear. Another complaint that I wish to make about the pediatrician, and that may also be made against the internist and other specialists, is the placing of the indication for the removal of tonsils and adenoids. Some very obscure case presents itself and the diagnosis not being easy, the pediatrician will often follow the popular assumption that the condition of the tonsils and adenoids are responsible for the trouble. He refers the case to the otolaryngologist who, without question acquiesces and performs the operation; the patient does not get well; on the contrary, is worse and in consequence the pediatrician will come in for considerable criticism by the people, but the otolaryngologist far more, namely, both from the pediatrician and the people. I have several such instances in my practice.

Neurology.—Perhaps in no other specialty is the association as marked as in these two, namely, between otolaryngology and neurology. More than 75 per cent. of cases in my private practice have symptoms that are referable to distinct nervous anatomical structures. I claim that an otolaryngologist at this present day must be a well-trained neurologist and psychiatrist in order to make a better diagnosis, that is, of general paresis, tabes, paranoia, dementia praecox, psychoneurosis of the various types as melancholia, manicdepression, hysteria, hysteroepilepsy, epilepsy, neurasthenia, brain lesions, tumors, whether syphilitic or not, hemorrhages, abscesses, cysts and meningitides, cranial nerve involvement and those of the cervical region already alluded to, and finally the great sympathetic nervous system with its ganglia. The analysis of a case whether it be within our field of treatment or not is one of the refinements in the practice of an otolaryngologist. It is not very easy to do, but I hope to be able to show how it may be facilitated. Many of the nervous diseases mentioned above have symptoms especially referable to the ear, nose and throat.

Skin and Venereal Diseases.—We can say that practically every type of skin disease can be found on the dermal surface of the special organs of the nose, throat and ear and many of the mucous membrane lesions within the nose and throat. In regard to venereal diseases, one of the commonest locations for syphilis is the ear, nose and throat and I certainly regard a very thorough training in syphilology and syphilography as a necessity for every otolaryngologist. In regard to gonorrhea this of course very rarely is found within the field of the otolaryngologist.

C. ASSOCIATED SPECIALTIES

Roentgenology.—This special field, particularly in diagnosis, cannot be overestimated, and while two or three years ago one occasionally heard an otolaryngologist say that the roentgenogram was of no value to him, it is now universally acknowledged as indispensable, particularly in sinus, mastoid and foreign body work in the upper-air passages.

One factor is very essential, and that is the interpretation of the plates. If a roentgenologist is to be able to interpret a plate he must have a complete knowledge of the case; that is, a complete history and the result of the physical examination. He should also be at the operation if possible to verify the diagnosis. The simple order that he take a photograph and to tell what the trouble is, is very unsatisfactory to all three parties—the

otolaryngologist, roentgenologist and the patient. The best method to obtain good results will be discussed later when we take up the subject of team work.

Pathologist.—Only unsatisfactory results can be expected without the aid of the pathologist, and the former method of one making his own urine analysis and have a specimen of tissue examined for diagnosis of cancer or the sputum for tuberculosis is a thing of the past. The constant demand for Wassermann and other blood examinations, the bacteriological examinations with intent of bacterial or vaccine therapy, the tissue examination other than malignancy, are some of the needs of the associated specialty of the pathologist. Here, as in the case of the roentgenologists, the otolaryngologist should be acquainted with the interpretation of the results obtained and the pathologist should also have a complete knowledge of the whole case. Professor Welch once said that the doctor who expects a pathological diagnosis without a complete history of the case must be classed among the unreasonable and ignorant.

TEAM WORK

Having thus outlined the relations of otolaryngology to the other special fields of medicine, I wish to call your attention to the practical application of all this, to what is generally known as team work. Team work is of comparatively recent origin, at least in the form it is now employed. One can unhesitatingly say it is of great benefit to science and the individual. There is a constant increase in the formation of such teams and the man who is not in one must certainly be lonesome at times. I have recently made an investigation in this connection and find that in Chicago alone there are eighty-four such teams, not considering a side partner or assistant, but associations of various specialists all well recognized in their special field. I was surprised to find with what rapidity these associations are being formed in smaller cities and reported as successful. The men usually have a suite of offices together and control of a hospital.

There are serious objections to these teams and their results. This point of view I would like to discuss, because, having had personal experience for more than twenty years with team work, I believe I am in a position to express views of its merits and demerits.

One of the great advantages claimed for team work is that no matter where the trouble may be, a positive diagnosis will be made before a patient leaves the office or hospital.

Secondly the prevention of possible error of diagnosing slight deviations from the normal or treating such and overlooking a more important condition; that is, one man is a check on the other. Again, by this association each man gives and takes of his particular special knowledge, thus keeping up with the most modern ideas. For example: The patient's history is taken and from the most important symptoms will the historian judge whether the medical man or surgeon is to see the case. After that particular individual, medical or surgical, has made an examination, the patient is referred to the various specialists as ophthalmologist, otolaryngologist, laboratologist, including roentgen ray, etc. When all the evidence is in, then the man in charge to whom the case was originally referred will sum it up and outline the treatment or refer it to one of his teammates. Such an examination may and frequently does take a week or more unless it is an emergency case. Let us assume that the patient was kept all the time in the hospital for observation and examination. At the end of such an examination it frequently occurs that a negative finding, in other words, "nothing the matter" is established. While it can be argued that it is better to go to a great deal of trouble in order to know that there is nothing the matter, than treat for some nonexistent condition, the fact remains that the laity are far from satisfied to spend so much time and money to find that out. This, then, is one objection. Another is that, especially in smaller cities, the otolaryngologist being associated with one set of men, will lose the referred work of those not associated with him.

Aside from these two important objections, one on the part of the patient the other on the part of the otolaryngologist, there are others of minor importance. It can nevertheless be stated that there is a big advantage for all concerned to have the team work in the practice of medicine. Your chairman has in the past two years been experimenting on the possibility of eliminating the two principle objections and believes he has accomplished the same, at least to his own satisfaction. It is by organizing a "team within a team."

Such a *team within a team* is feasible and practicable in any city, with two or more men making up such a team. Some years ago in Chicago several eye, ear, nose and throat specialists who had been practicing independently banded together and organized team work, confined as I understand it, to the practice of these special branches; that is, one does the eye work, the other the

nose, especially the sinuses and the throat, a third does the ear and its complications, etc. Yet all of them are able to take care of all the four branches.

That is not the type of team that I am referring to, however. The team work that I suggest and have personal knowledge of is the following:

1. A chief of staff, who is a thoroughly trained eye, ear, nose and throat man, including all the borderline work. He is the main consultant in the team.

2. First associate, who is equally well trained to do all this work, having in charge the business end of the association and his special work is the ear.

3. Second associate, is well trained in all the branches, being a man of considerable experience in general practice, especially in general surgery. He has charge of the nose and throat department. He makes all the general physical examination and is the first assistant in all the major operations, that is, borderline work.

4. Third associate who is qualified in all the branches, but ophthalmology is his special field. He is also the first assistant to the first associate in all the surgical work.

5. Fourth associate, same qualifications as the others and his special field is neurology and psychiatry as it applies to our field, particularly diagnosis.

6. Fifth associate who is the house physician, that is, hospital service. Is trained in all of the four branches, but has special charge of all patients in the hospital. Is the resident in that he (in our case a lady physician) lives in the hospital. Is also alternate anesthetist and has charge of the laboratory including the Roentgen ray. That does not mean that he or she is the pathologist, roentgenologist, etc., but must see to it that all necessary laboratory work has been done, has controlled it and reports in person the findings in connection with every case.

7. A thorough trained surgical nurse in the operating room, having charge of all the supplies, instruments and the preparation of the patients for operation, and after-care. Also training of pupil nurses in our special field.

8. Anesthetist specially trained in our line of work.

9. Historian, librarian and secretary. This is one especially trained in the work of our specialty and can substitute the anesthetist, surgical nurse or any assistant.

10. A dentist who has been specially trained in diagnoses of dental and oral conditions in reference to otolaryngologic conditions.

Such a combination is very refreshing and stimulating and makes every one feel that any one may be displaced—in other words, no one is indispensable.

Fortunately, this game of treating a case of eye, ear, nose and throat affections can be done with a smaller number. Three people can do it all, as the first man is the surgeon and confines his work to the ear, nose and throat, and borderline work. The second, is the main assistant who can do the same work but has the eye to do besides. He also does the after-treatments and local treatments. Between them they divide general diagnosis and neurology, and one becomes the business head. The third party is a thoroughly trained nurse who is at the same time the anesthetist, laboratory control, as well as the librarian, historian and secretary. She has complete charge of the operating rooms, etc., as well as the resident that lives in the hospital, to look after the cases in the hospital.

Whether the team is composed of two, five or ten depends upon the amount of work that there is to do. It must be borne in mind that a certain business element must be considered in this connection, that if one wishes results either scientific or pecuniary it is necessary to spend time, effort and money.

An axiom that will fit the case is: "Be liberal and you will be liberally dealt with," and conversely "for nothing you get nothing."

We therefore find out within our team just what ails the patient and if the trouble is located, and find that it is not within the province of our special field, we are in a position to refer the case to the proper place or call in the consultant we think should be called, to fit that particular case. Again our patient is not sent from one specialist to another to have to tell their history over and over and only to find out that there is a negative result, that is, nothing the matter, or a half dozen different diagnoses which are only confusing.

THE DIAGNOSTIC VALUE OF RECORDS OF BREATHING AND OF SPEECH

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NEW YORK

What the senses of vision, hearing and touch, perceive of the functions of breathing and speech are but external manifestations of centrally localized functions. The discussion of the center of breathing within the medulla oblongata and of the various speech centers within the brain does not belong in the realm of this essay. The science of experimental phonetics occupies itself with the investigation of the visible, audible and tangible muscular activities of breathing and speech. This recently emancipated special branch of medicine developed methods of examination which proved to be not only of great value in diagnosing disturbances of speech and breathing, but also of help in their treatment. During the last decade masters and students of phonetics evolved numerous very interesting pieces of apparatus for recording the external manifestations of breathing and speech.

I will, however, restrict myself to the description of the devices used at the Speech Laboratory of the Neurological Department of Vanderbilt Clinic, College of Physicians and Surgeons, New York. The rich clinical material of Professor Tilney's neurological department and of the speech work in charge by Mrs. E. W. Scripture afforded me the opportunity for taking and studying numerous records of breathing and speech in defects of speech and in neurological diseases where speech and breathing is affected.

For recording the inspiratory and expiratory movements of the chest and the abdomen, both during mere breathing and during speech, I constructed a device similar to Gutzmann's belt pneumograph. It consists of an oblong rubber bag fastened to an unelastic strap. Through a small outlet air may be blown into the bag. Between the bag and the strap there is interposed an excavated pelotte covered with a thin rubber membrane. The neck of the pelotte pierces the strap and is covered by a tube that leads to the recording tambour. Belt pneumographs are fastened to the chest and abdomen. The expansion and contraction of the thorax and abdomen cause, within the rubber bag,

differences of air pressure that are imparted to the adjoining membrane of the pelotte and are from there conducted through the tube to the recording tambour. The latter is a metal cup covered by a thin rubber membrane, to which a sensitive lever is fastened. With the afflux or efflux of air from the pneumograph the point of the lever moves up and down rotating on a "recording drum." Thereby a white line is registered on the soot of the paper stretched around the metal cylinder. The rotation of the latter is regulated by a clockwork. The paper that had been previously smoked over a candle or a gas flame is, after obtaining the record, removed from the metal cylinder and dipped into a shellac-alcohol solution. By drying in the air the record becomes fixed.

The vibrations of the air current passing through the mouth are recorded by the same arrangement, except that the belt pneumograph is replaced by a funnel held over the mouth. To examine the quality of the air current passing through the nose and to test simultaneously the activity of the soft palate, the rubber funnel of the former experiment is replaced by a nasal tip of glass that tightly fits into the nostril. The movements of the tongue are studied by placing small exploratory bulbs of rubber in front of the tip of the tongue or at any desired part of its curvature.

The articulatory movements of the lower jaw are registered by means of a tambour placed beneath it. The movements of the lips are traced by fastening a sausage-shaped rubber tube above the upper lip or by having a small rubber bulb held between the lips. The upward and downward movement of the larynx are recorded by means of a Brondgeest's capsule fastened around the neck.

Zwaardemaker's apparatus, combining in a general way the above described apparatus, records all articulatory movements simultaneously. The vibrations of the vocal cords are directly traced with the aid of the Krueger-Wirth laryngeal tone registering apparatus whereby an adequately constructed pelotte is placed over the larynx and a specially sensitive tambour registers the vibrations imparted to it. A different type of speech registering apparatus is that of Koenig. In a system of rotating mirrors there are reflected the jerks of a gas flame, representing the reproductions of the sound waves spoken into the trumpet of the manometric capsule. By using the proper gas, these waves may be photographed. Roentgen pictures of the back of the tongue and of the soft palate may be easily taken by the method

of Froeschel and Haudek, the merits of which became evident to me during my recent stay at Froeschel's Speech Laboratory in Vienna. On the back of the tongue and on the soft palate a small strip of bismuth nitrate is painted. The different positions of these important speech muscles may then be distinctly roentgenographed.

The taking of gramophonic and phonographic records proves to be a great aid in experimental phonetics. By means of a complicated apparatus the speech records thus obtained may be retraced on smoked paper. Kinematographic pictures of the muscular speech movements and of the accessory movements of other muscles, as especially noticeable in stuttering, should be taken for didactic purposes. To record the contact of the tongue with the hard palate and the teeth a cast of the mouth and from it an artificial plate is made and varnished. Its inner surface is oiled and dusted with chalk. Wherever the tongue touches the plate, the chalk is wiped off. The resulting picture may be photographed or drawn on a cast or on paper. By pressing a folded piece of smoked paper between the lips, the soot is wiped off by their touch. The shape of the resulting black oval is characteristic for different speech disturbances, especially in stuttering on b, p and m.

From our collection of records of speech and breathing we will select for discussion those that prove the diagnostic value of this method. In the normal individual the striking peculiarities of the breathing and speech curves are their regularity. The length of the wave for inspiration and expiration in both thorax and abdomen is almost the same, the expiration being only slightly longer. The breathing curve of the nose is somewhat irregular, but shows also the same length of the rising and of the falling part of the curve. During respiration without speech the air is inhaled through the nose. The moment we start to speak, the nasal breathing curve becomes a straight line. Elevations are then only noticeable when the letters m, n or ng are pronounced, whereby the air escapes through the nose. During speech changes of similar importance are also noticeable on the thoracic and abdominal breathing curves. While during mere breathing inspiration and expiration are of the same length, during speech the former is very short while the latter is rather long. The quick inhalation goes through the mouth with the exclusion of the nose, and we speak on a prolonged exhalation.

Normal breathing curves are indicative of a correct economy of breathing. There exists beyond doubt an intimate correla-

tion between breath and speech. In the suckling and in the very young child, breathing is quite irregular; this corresponds to the fact that the baby does not yet master the difficult art of controlling the muscles of speech. Once this ataxic stage is overcome through training and the faculty of speech became fully developed, the process of breathing begins to show the remarkable regularity described above. While mere breathing is an involuntary act, breathing during speech is undoubtedly under cortical influence. This explains the unbalanced control of breath in speech disturbances of nervous origin. In another article the writer will go deeper into this question and will prove the necessity of assuming within the circle of speech the existence of a special articulorespiratory center. The affection of this center or of its connection with the other speech centers explains the pathological changes of breathing in certain speech defects.

We will now proceed to the discussion of the diagnostic value of the curves of breathing and of speech. The study of the breathing curve of the stutterer reveals the following interesting facts: In lighter cases of stuttering the curves in mere breathing may appear normal. But in quite a number of the more pronounced cases of stuttering even the curves of mere breathing show irregular elevations, interruptions, sudden jerks and other deviations from the normal curve that point to a lack of control of the economy of breath. Basing on these findings the experienced observer may in many instances diagnose the case as one of stuttering, without the stutterer having uttered even one word. During speech, the thoracic and abdominal breathing curves of the stutterer become directly pathological or so to say, pathognomonic. We find the short inspiration and long expiration replaced by an irregular conglomerate of inspiratory and expiratory jerks, by straight lines indicating the stoppage of breath and by asymmetrical undulations. The underlying causes for these uncontrolled interruptions and expulsions of breath are irregular contractions, spasms, sudden rigidities and cramps of the respiratory muscles both of the thorax and the abdomen. The nasal breathing curve in the stutterer shows during speech characteristic fluctuations, not only on the pronunciation of the letters m, n and ng, where the air normally escapes through the nose, but with every sound uttered. The cause thereof is the extension of the irregular concussions of breath to the soft palate and thereby to the air space within the nasal cavity.

A comparison of the breathing records taken upon the admission of the patient to the clinic and at regular intervals during the process of the treatment is of interest. The curves show the tendency of becoming more and more regular, till after a number of months they can hardly be differentiated from those of a normally speaking and breathing individual. This demonstrates objectively the value of the method of treatment, consisting principally in recovering the lost control of the power of breathing and of will. The mouth record of the stutterer's voice shows vowel vibrations entirely different from the norm. By measuring them under the microscope the pitch of the laryngeal tone may be calculated. The "melody plot" (E. W. Scripture) thus obtained shows a marked monotony of the stutterer's voice. This symptom, too, may be easily explained by the lack of control of breath. Breathing and speech records in stuttering are of great aid in detecting a simulation of this speech disturbance. This is of great importance in European countries, where the stutterer is exempted from military service. Stuttering is characterized by the interruption of the current of otherwise well-developed speech. In stammering we find a mispronunciation of the different letters as the distinguishing feature. We may stammer on any letter of the alphabet. Stammering on s is called lipping. Substitution of other sounds for k and g, for l and r is called paragrammacism, paralambdacism, pararhotacism, etc. In all these instances the mouth records of the letters to be pronounced are quite characteristic. In pronouncing, for instance, the letter s the air escapes from the mouth through a very narrow space between the tip of the tongue and the upper incisor teeth. In lateral sigmatism the air rushes out between the lateral part of the tongue and the molar teeth.

If a rubber tube, connected with the recording apparatus, is moved in front of the teeth from the center to the sides we can exactly register the quality of the lisped s and the place where it is pronounced. By holding the tube first in front of the observer's and then of the patient's incisor teeth, the latter by imitating the s waves seen on the former's record gradually learns the correct way of pronouncing s. This method of visual training is also of value in reeducation, when the faulty s was due to malformation of the jaw and teeth, after this organic defect has been relieved by the orthodontist. It is a remarkable fact that in severe cases of stammering, especially in the congenital and neurotic form, irregular curves of breathing are met with in many instances. This again proves our assumption that the vast majority of

speech defects are secondary to a primary nervous lack or loss of control of the economy of breath.

For the otolaryngologist the records of breathing and speech are of special diagnostic value, as they reveal abnormal functions of organs that belong to the realm of his specialty. There is no norm as to the size of a turbinate or as to the straightness of the septum. The main reason for removing a hypertrophied turbinate or for submucously resecting a deviated septum is their interference with nasal breathing. A breathing record of the obstructed nose, when showing marked abnormalities, will be for both the doctor and the patient a reliable objective indication for surgical interference. The success of the operation will be proved, when a later breathing record of the nose turns out to coincide with the normal curve. The following record of breathing and speech is of diagnostic value from both a rhinologic and phonetic point of view. The young man had stuttered for many years. His stuttering was restricted to the letters m and n. Instead of m and n he said, however, constantly b and d. Thus if he intended to say my he would stutter b-b-b-b-by, and instead of saying not, he would stutter d-d-d-d-d-ot. I diagnosed the case as one of stammering on the letters m and n that developed later, as it occurs in some instances, into stuttering on these letters. The nasal breathing curve showed a wave of infinitesimal elevations and during the pronunciation of m, n and ng it rose only to a very slight degree. From the nasal breathing curve and the normal function of the soft palate I made the diagnosis of rhinolalia clausa anterior. Subsequent rhinologic examination revealed both nasal cavities to be totally obstructed by numerous polypi. For organic reasons, therefore, the patient was stammering on the m and n, replacing these letters by b and d, respectively. For in m and b as well as in n and d the position of the tongue and the lips are identical. On account of the nasal obstruction the air could not escape through the nose as is normally the case in the pronunciation of m and n and the intended m and n assumed the sound of b and d, respectively. The intention of overcoming this embarrassing speech defect led on to nervous exaggeration of the muscular activity of the lips and of the tongue that finally developed into the stuttering. The treatment in this case consisted of removal of the nasal polypi followed by general training in the speech class, whereby the normal pronunciation of m and n was soon achieved.

In affections of the soft palate the nasal breathing curve proves to be of great diagnostic value. The nasal breathing

curve of an elderly woman referred from the neurological department for slight indistinctness of speech just becoming noticeable, showed the escape of air through the nose at the pronunciation of every letter of the alphabet. I made a tentative diagnosis of beginning bulbar paralysis, the first symptom of which was the leakage of air through the soft palate. Upon inspection there was no abnormality as yet noticeable. The soon-developing clinical symptoms confirmed the diagnosis that was primarily made on the evidence of the nasal breathing record.

In cleft palate of course the air rushes continuously through the nose, and accordingly we find a bizarre nasal breathing curve. The question whether or not a cleft palate has been successfully operated upon can only be solved by the nasal curve. In a number of instances where from the operator's point of view the cleft had been ideally closed, the nasal record shows that the soft palate as far as its function as a speech muscle is concerned did not improve. Due to its inactivity the muscle had become atrophied.

Electric stimulation and speech training will help to restore muscular contractability and thereby improved speech. The correctness of an obturator destined to fill out the defect of the palate may also be demonstrated by the nasal curve. As long as it still shows a considerable escape of air between the mechanical device and the pharyngeal wall, the obturator is far from answering its purpose. In a young stutterer the nasal curve laid to the diagnosis of insufficiency of the soft palate. In children with large tonsils and adenoids the nasal curve gives the explanation for the peculiar nasal twang met with. It is a mistake to assume that this "adenoid speech" will always disappear after the operation. The nasal curve in quite many of these cases showed the persistence of the speech disturbance. Careful training in order to readjust the muscular activity of the soft palate to the new volume of the buccal and nasal cavities is essential. Before performing any operation on the respiratory organs of a singer, a mouth and laryngeal record of the voice should be taken. It should then be compared with the record taken after the operation in order to find out whether the voice underwent any changes.

The perfect control of breath is essential with singers. "The constant rate of air expenditure is maintained by muscular resistance of the diaphragm and the muscles around the thorax. Pneumographic tracings should show steady movements of chest or abdomen and not one of varying rapidity or irregular character. Some of the troubles of singers arise from letting out

the air too rapidly at first. The cure consists in instruction in breathing profitably aided by registering the results with the pneumograph." (E. W. Scripture.)

In the study and training of deafness (we reject the term deafmutism, as these children may be taught to talk) both in its acquired and congenital form, the breathing curve is of importance. Gutzmann, the master of phonetics, first called attention to the peculiarity of the breathing curves of the deaf. I examined quite a number of deafs and found Gutzmann's statement affirmed. In acquired deafness, the pneumographic curve in mere breathing shows no peculiarities; it differs, however, during speech considerably from the norm. The inspirations are extremely frequent. The relation between the length of inspiration and expiration also deviates considerably from the rule. If the child repeats the same sentence a few times, the described abnormalities of breathing curve apparently correct themselves, as if the inhibition at the start had been overcome and the child regained the easier mode of speaking of the time when it could hear. The deaf child, in comparison with the normal, speaks remarkably few syllables on one breath. Evidently much more power is expended in the articulatory movements, as evidenced in the expiratory jerks of the thoracic record. This fact causes the characteristic heavy speech of the deaf. In a congenitally deaf child the above peculiarities appear much more pronounced. The number of inspirations during speech exceed those during mere breathing in an astonishing way. The thoracic breathing curves show an extremely ataxic character.

Gutzmann arrives at the following conclusions: The later deafness is acquired, the more the breathing curve during speech will approach the norm. We may immediately judge from the breathing curves of a deaf child, whether its affection is an acquired or congenital one. Systematic breathing exercises gradually change the type of abnormal breathing even in the congenitally deaf, whereby the entire process of speech improves.

In the early diagnosis of quite a number of nervous disorders the breathing curves may be of aid. We have already mentioned the case of beginning bulbar paralysis, where the abnormal nasal curve was the first objective symptom.

As an initial symptom of multiple sclerosis, frequently a certain tiredness of voice is complained of, that manifests itself in a distinct tremolo. This respiratory trembling may be clearly seen in the pneumographic curve of the thorax.

In a case of chorea minor, in a young girl, the thoracal breathing curve during speech showed distinctly choreatic jerks, while it was very difficult to demonstrate them on other muscles. The rapid tiredness and exhaustion of the articulatory muscles in myasthenic paralysis is easily demonstrable by the mouth record of a repeatedly spoken syllable. The excursions of the lever become after a very short time smaller in number and size and soon disappear.

A mouth record in paralysis agitans shows from the impulse to speak to the first exploded word a straight line corresponding to the reaction time between the two.

In a case of hysterical aphonia the mouth and breathing record gave valuable information about the underlying cause and was suggestive of the treatment. The young girl lost her voice at intervals, the last attack was of six months' duration and no treatment was of avail. The mouth record showed that the patient had no power of breath at all. Whenever she tried to blow, the record showed only a straight line. The breathing curves of the thorax and abdomen showed remarkable irregularities. The loss of control of the economy of breath was apparently the causative factor for the loss of voice. For the vocal cords could be closed normally, they were also brought into the right tension, only the correct power of breath was missing to make them vibrate. By training her to blow out a candle at gradually bigger distances from the mouth and by making her move a feather held over the nostril, she slowly regained some power of breath. A short training in correct breathing soon helped to restore her voice.

In one of her lectures at Columbia University Mrs. Scripture emphasizes the diagnostic value of the records of speech and breathing. She lays special stress upon the cooperation between the speech clinic and the speech research laboratory. The taking of records of breathing and of speech upon the admission of the patient and at regular intervals thereafter furthers in her opinion the work in speech corrections, both from a diagnostic and therapeutic point of view. By having the speech laboratory work in the hands of a laryngologist, a simultaneous supervision of the organs of speech and breathing, so frequently affected in speech disturbances, is assured.

I wish to thank Mrs. Scripture for the rich clinical material of speech defects and Professor Tilney for the opportunity of doing phonetic research work in the Speech Laboratory of the Neurological Department of Columbia University.

SYMPOSIUM ON THE EDUCATION OF THE DEAF

- (a) Introduction DR. JOS. C. BECK, Chicago
 - (b) Pedagogical and Otological Cooperation in the Education of the Deaf.....DR. M. A. GOLDSTEIN, St. Louis
 - (c) Practical Demonstration of Progressive Oral Methods in Training the Deaf.....
...MISS ETHEL M. HILLIARD and MISS JOSEPHINE AVONDINO, St. Louis
 - (d) Are the Profoundly and Incurable Deaf to be Left to Work Out Their Salvation, Material and Otherwise?.....
.....DR. H. B. YOUNG, Burlington, Ia.
 - (e) Discussion.
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INTRODUCTION TO SYMPOSIUM

J. C. BECK, M.D.

CHICAGO

Ladies and Gentlemen:—This morning's program has been in the minds of the members of the Academy for a long time, and it gives me great pleasure to have the opportunity of seeing the wish fulfilled. The tremendous handicap of a hard-of-hearing or deaf person, to say nothing of the mutism, can scarcely be appreciated by the majority of the people, and only those, either physicians, teachers or their immediate family and friends, will feel for them. It is therefore a great pleasure to anticipate what these great teachers of the deaf are going to show and tell us of the progress and accomplishments along these lines. The ladies and gentlemen in this symposium have gone to a great deal of effort and I hope the attention as well as discussion will justify their labor and that they will feel encouraged to go on in this work even though it is uphill and often times discouraging.

It was suggested that I present a paper in this symposium, as I have been very much interested for a long time in the education of the deaf, but I had to decline owing to the lack of time and not enough experience. I have, however, prepared an outline of a lecture on "How to Prevent Deafness" that should serve as an example and may be changed to suit each occasion.

This is to be in the form of a public lecture to the laity, but it should be delivered by an otolaryngologist. It should be well

illustrated with schematic drawings and figures, also actual photographs wherever they will show plainly the cause and effect. Such lectures should be given to the local press with illustrations, without reference to any physician's name and particularly not the man delivering the lecture, unless he or she be out of the practice of medicine as is Dr. Evans and other writers on "Public Health" in newspapers.

The lecturer should have one cut showing a section of the head and neck which would demonstrate the relation of the nose and throat to the ear, in order to explain how infection may travel to the ear.

A second cut is to show the ear very grossly so as to explain the involvement and the importance of the labyrinth.

A third cut should show some of the commonest causes of hardness of hearing and deafness from infections following exanthemata, syphilis, alcohol and otosclerosis. Mention should be made (a) of how improper blowing and douching of the nose or the treatment of an acute nose inflammation may set up an ear trouble; (b) of the various occupations that may cause hardness of hearing or deafness.

PEDAGOGICAL AND OTOLOGICAL COOPERATION IN THE EDUCATION OF THE DEAF

M. A. GOLDSTEIN, M.D.

ST. LOUIS

Nineteen years ago I presented a class of deaf pupils from the St. Joseph School for the Deaf in St. Louis to the American Academy of Ophthalmology and Otolaryngology at its second annual meeting in St. Louis; the purpose of this demonstration was to present the results of two years' work with the Urban-tschitsch system of aural gymnastics to stimulate the latent auditory nerve in pupils where some remnant of hearing was still retained.

There is a field in this form of aural training, but it is quite limited. Deaf pupils must be classified as semi-deaf. Bezold of Munich, in his accurately and scientifically described experiments and tests with the function of hearing, has called these hearing remnants "tone-islands." It has been otologically accepted that if the functional tests for hearing in a given case indicate a hearing capacity less than that embraced in the working "tone-islands," that such pupils will develop only meager results from this form of aural gymnastics.

Unfortunately, the majority of deaf children that come within the educational province of the state have a deafness of more profound character and cannot be taught by such methods.

The principal methods of education of the deaf are: (1) signs and the manual alphabet; (2) a combined system which includes both signs and the manual alphabet, and a limited amount of speech training; (3) the pure oral system.

There has been a long-standing controversy between the advocates of the sign system on the one hand and the champions of the oral system on the other, the former endeavoring to hold tenaciously to an antiquated system of education, and the latter contending with many handicaps to prove the efficiency of pure oralism. As a compromise to these contending factions an intermediate position has been effected, which seems to have found endorsement in many of the state institutions for the deaf and some private schools in this country.

Notwithstanding political, financial, pedagogic and personal influences that have been brought to bear by the advocates of

sign methods, the oral system is making progress rapidly, is gaining additional support wherever the results of this system can be demonstrated and is raising the percentage of this form of training in America.

In comparison with the great civilized nations on the other side of the Atlantic our standards of education of the deaf do not show the same strength and progress. Germany with its 100 schools for the teaching of the deaf under the direction of the minister of education of the state, shows 100 per cent. oral training; Austria in its statistics has 92 per cent.; Norway, in the extreme north of Europe, shows 85 per cent.; Great Britain, with its usual conservative attitude, has over 70 per cent. Compared with these America has scarcely developed beyond 60 per cent. of oral training for the deaf embraced in its state schools, departments of municipal public schools, private institutions, etc.

The field of oral training is a virgin one; the surface has hardly been scratched. There are too few doctors, I am sorry to say, who have been actively interested in analyzing the various systems by which the deaf can be more effectively and more satisfactorily trained. There are even ear specialists of our own national organizations who are not familiar with the work done in their own state schools for the deaf and are not in a position to intelligently advise the guardian of a deaf child what to do, where, when and why to send them for such special education.

The nearest cooperation we have had from the medical profession has been by functional tests of hearing to determine the degree of deafness, and when the child has been found too profoundly deaf to get any benefits from medical attention, to tell the family that nothing can be done for it.

The normal child is trained by the state and by the community, and receives the careful attention of educators, physicians, legislators, and the rank and file of the citizens of the community. The defective child, whether blind or deaf, has just as much claim on the community and the state, as has the normal child and it is entitled to a full share of consideration in all of the progressive methods of education that such a community or state may develop. We all assume the responsibility in the upbuilding and improvement in methods in the education of the normal child. I regret to say there are but few doctors who have taken an active interest in the development and training of the defective child, and your responsibilities do not end with a perfunctory advice to the guardian of a defective child to send him to the nearest state institution for his education. You especially,

as ear specialists, should be concerned with the same intimate question of studying the respective merits of the various systems of education which have been developed for the training of the deaf child, and you owe an obligation to your home community and to the state, to give this matter your active attention and bring the influence of your own special training to bear on this significant question.

It was with this end in view that the Central Institute for the Deaf was organized, for here we are endeavoring for the first time in this country to combine the efforts of the trained pedagogue in this special field of education with that of the experienced specialist in otology. At present the Central Institute for the Deaf may still be considered as an experimental laboratory of psychological research in the problems of the deaf, and in the endeavors that we are making to carefully study the various phases of education, their effect on the individual pupil, the tests of functional capacity in the light of recent scientific progress in the physiology and pathology of the labyrinth, and finally in noting the results of the various modifications and innovations that have been suggested for the improvement in training the deaf child by purely oral methods.

DEMONSTRATION OF CASES

CASE 1.—This little girl is congenitally deaf; by functional test we could declare her otologically totally deaf, though there were evidences of hearing remnants when I made these tests in September, 1914. The child could apparently hear "Ah!" and "Oh!" when called loudly into her ear at close range, and she seemed to hear the words "Mamma" and "Baby." It was difficult to determine whether these sounds were actually heard, or whether there was some difference in the tactile sense when these individual sounds were made that gave the child an inkling of such difference in the production of sound. She came to us babbling unintelligently; what her progress has been as the result of one year's training in pure oral work, will be demonstrated to you by her teachers today.

In studying the psychology of deafness we find that the auditory sense organ is susceptible to some power of regeneration; today this child can hear complete sentences and carry on a limited conversation in a vocabulary to which she has thus far been educated. If you call into her ear sentences that are familiar to her and that she has been taught to speak, she can hear them aurally almost as readily as she can read the lips. From this observation we are justified in the conclusion that her auditory perception, which was practically nil when first tested a year ago, is showing signs of regeneration with the development of her education.

John Tyndall says that the five special sense organs are all modifications of the sense of touch. If you develop to a high degree of efficiency the four special sense organs still possible to a deaf child, it is possible to conceive that the increased acuity of these varying tactile impressions may be reconstructive as far as a possible stimulation of the auditory nerve is concerned. What the real psychological explanation of this observation may be, I am not prepared to say at the present time.

CASE 2.—This little girl is 8 years old. At 4 years of age she had a severe meningitis, diagnosed as tubercular. Until two years ago she wore a plaster and leather jacket for scoliosis. Her hearing was normal until the time of her attack of meningitis—a big consideration in the question of selecting the proper method for the training of a deaf child at that period. The generally accepted classification of deafness is as follows:

1. Total deafness, under 3 years of age before the acquisition of speech.
2. Total deafness after speech has been acquired. (This little girl belongs to this class.)
3. Semi-deafness, with a "tone-island" of Bezold present, admitting of some possible aural training.
4. The hard-of-hearing child, not able to carry on its education in the normal schoolroom but requiring more individual instruction.

This child still retains fluent speech and by means of the oral system of education this speech will be conserved. What a tremendous asset to this child and how great a loss it would be to her had she come into a school in which the sign methods were in vogue or where the combined system is taught! Today this little girl, after only one year's training, is able to converse fluently with her hearing fellows, reads the lips well, is as far advanced in her scholastic work as the average normal child and will remain, as her educational progress develops, quite a useful member of the community. Her voice is still fairly flexible, (demonstration). She evidently exercises some form of tone control, as she can modulate the voice mechanically to produce at least six or seven different tones of the musical scale. These tones are not accurate in pitch, but they are a splendid asset in training the pupil to voice modulation and in overcoming the characteristic monotone, so noticeable in the speech of the deaf.

CASE 3.—This little girl of 9 years of age, is an excellent example of intelligent home energy. The mother has attempted to teach her lip reading and has succeeded in unconsciously inculcating some of the principles of this form of communication so definitely that the child is destined to be an unusually apt disciple of this method. At 9 years of age she is almost a perfect lip reader today; she has been totally deaf since her fourth year; deafness acquired, as near as I can obtain the information, from a severe attack of malaria. (Here followed a demonstration of lip reading by this pupil of individuals in the audience in different parts of the hall.)

CASE 4.—This boy of 10 came from the South last week. Until a year and a half ago he was an absolutely normal child, as far as his every faculty was concerned. He contracted epidemic meningitis and was saved by the serum, but it left him absolutely deaf. There is no reaction to the turning or Thermo tests in the examination of the labyrinth. The point that I wish to emphasize in this particular case is the selection of this lad's method of education. He is the son of a prominent optician in one of the largest cities of the South; he consulted a prominent otologist, who after examination, referred him to the school for the deaf of that city. Some of the staff of this special school, recognizing that all that was at present necessary for this boy's future was to make of him an apt lip reader, referred him to our institution. By attentive training and usual industry this boy should become a proficient lip reader within a year. He may then continue his scholastic work in the regular classroom of the public school of his home town. Had he remained at a state institution for the deaf, where such individual training is as yet not possible, and where he would have been thrown in contact with children who use signs and the manual alphabet, it is quite likely he would have lost his power of speech and the opportunity of an education which will permit him in time to associate with his fellows on an apparently equal basis.

Those of us who are championing the cause of oral training of the deaf are finding many obstacles. Like you, I have been a practicing otolaryngologist and active for over twenty years in this field. I am trying to accept the responsibilities which this phase of education in the life history of the deaf calls forth among the profession. There are but few of us thus far who have recognized that such a responsibility exists. Dr. Hudson-Makuen of Philadelphia has been one of the constant active champions endeavoring to enlist the interests of the medical profession. Dr. Frank Allport of Chicago has done a great service to the cause by developing the problem of systematic examinations of the eyes, ears, noses and throats of children in the public schools of our communities and in the state, and thus providing definite statistics which may guide us in the future in the development of these serious problems.

I have been observing this form of special education for twenty years and have long felt the necessity of enlisting the cooperation of the otological profession with the professional teachers of the deaf, and the Central Institute for the Deaf organized in September, 1914, and now in its second year of activities, is the outcome of these energies. Endorsed by a group of prominent and progressive otologists in various medical centers of this country and by a number of distinguished educators of the deaf who are advocates and enthusiasts of oral

training, the Central Institute for the Deaf was created as a working body to amalgamate these various activities.

We have been invited here today by the courtesy of the president of this organization and his active program committee, because they recognized the fact that we were making efforts to develop a new phase in this form of education. We have brought from St. Louis a number of our pupils to practically illustrate the various steps undertaken in the education of the deaf child by the exclusively oral system, adapting all of the approved ideas of the Montessori system for educating the tactile sense; the five slate system for a practical comprehension of language construction, the use of the piano to develop acuity of rhythm and some tactile appreciation of pitch in the deaf child; the Urbantschitsch method for the stimulation of latent remnants of hearing, and above all the application of the experience of trained otologists in the study of the psychological and physiological conditions of the individual pupil.

To work out these problems successfully it has been our privilege and good fortune to engage the services of one of the most favorably known and best qualified experienced teachers of the deaf, Miss Ethel M. Hilliard, the principal of our institution; and the experienced, energetic, keen observer and teacher, our senior instructor, Miss Josephine Avondino.

It is with much gratification that I am able to present these ladies to this annual Academy meeting and I hope that the practical demonstration which they have provided for you will bear rich fruit.

PRACTICAL DEMONSTRATION OF PROGRESSIVE
ORAL METHODS IN TRAINING THE DEAF—
ILLUSTRATED WITH PUPILS OF THE CEN-
TRAL INSTITUTE FOR THE DEAF

MISS ETHEL M. HILLIARD

AND

MISS JOSEPHINE AVONDINO

ST. LOUIS

Our object in coming before you today is to present the practical results of oral training in the case of several children who have been under instruction at the Central Institute for the Deaf. We wish to show the possibilities of applying to the deaf child, as nearly as the limitations of deafness will allow, the standards of the normal child. Let me say, at the outset, that we are claiming nothing new. We are doing nothing startlingly original, but we are applying intensively the principles that have actuated progressive teachers of the deaf for quite a number of decades. We are endeavoring to find out how near to the normal we can possibly bring the deaf child.

It seems to me, if I were a physician, I could not feel that my duty had been fully done when I had said to the mother of a deaf child, "Medical skill can do nothing for you; your child must depend now upon education." It would seem that the advising physician should be conversant with educational methods in use with deaf children, should know what his own state and his own community are offering for them, and, in case the instruction offered at home should be inadequate to the needs of each particular case, he should know where the individual needs could be filled. Until every deaf child in the United States is subject to advice that will put him in connection with people who will do for him the things that his individual case demands, we have not done our duty as physicians diagnosing individual cases nor as educators providing appropriate instruction.

The difference between the very small deaf child, say up to the second or third year of his life, and that of the hearing child is very slight, but at an early age the hearing child begins to comprehend language and to express himself intelligently, reaching out for information; and here the difference becomes manifest. The hearing child constantly surprises his elders with the use

of big words, which he repeats incorrectly at first, but which he is soon able to correct, using his hearing as his means of making his own speech approach the standard. The deaf child misses all this, and the lack can only be supplied by early instruction given by expert educators. The education of the deaf child should proceed as nearly like that of the hearing child as possible. Speech should be taught, and lip reading should be made to supply the place of hearing. Children's minds develop in pretty much the same way. When the deaf child goes to school, his mind is active and his habits of thought are very much like those of normal children. He knows how to use his toys, his knives and forks, how to dress and undress himself, in fact, his outward acts are just the same as those of hearing children. The difference comes in his not knowing the names of things. He does not know that he has a name of his very own. It is rather pathetic to watch the pleased surprise on the part of a deaf child when he discovers that a certain word made by certain movements of the lips or by certain marks on paper or the blackboard belongs exclusively to him.

The formal education of the deaf child begins with the cultivation of his senses. He needs even more than the hearing child the power of receiving acute impressions through his senses. He must see well and he must be sensitive to touch impressions. Madame Montessori has developed a splendid system of cultivating the senses of hearing children, and she acknowledges her indebtedness to the fundamental ideas of the educators of deaf and subnormal children, who long since realized the importance of making other senses compensate for the loss of one. Miss Avondino will show you how the teacher of the deaf gives the initial steps toward this sense training. The effort at first is to arouse attention and secure accuracy. You will see these children matching colors and finding the difference in textures, and you may think the process a simple one. For most children it involves merely calling the attention of the child to broad differences and then slight ones, but with some children the process is slow. The sense training exercises look toward speech and the teaching of mechanical speech is a very interesting thing. It is scientific and technical, and it has to be very carefully done to awaken and sustain the interest of the child in using the speech organs.

Most of us do not think that the words we utter are made up of a great many different sounds. Some of us can with

difficulty analyze words into their component elementary sounds, but many of us find it difficult, because we are accustomed to talking smoothly, not stopping to think of each particular sound. When phonetics are taught to a hearing child the process is analytic. The hearing child already knows the word, and understanding the sound composition of the word is easy. With the deaf child, the process is exactly the opposite. He does not know the word as a whole. He must first be taught the elementary sounds, and then instructed how to put them together to make syllables and words. In other words, he must understand the synthesis of the word, which is very much harder for him than analysis is for the hearing child. Let us see how some of the simplest sounds are taught. Take a slip of paper. Hold it a few inches from your lips and blow. The result is the phonetic value of *wh*. The slip of paper serves to show to the deaf child the force of a stream of breath. Now place the fingers of the deaf child, which by training have become sensitive to touch impressions, on your throat, and give voice with the lips in a position of *wh*. Thus the sound of *w* is produced. The deaf child is able to imitate these sounds, having obtained through sight and touch the conception of the formation of the sounds. A little puff of breath, coming quickly through suddenly parted lips, gives the sound of *p*. A stream of breath forced over the lower lip, as it touches the upper teeth gives *f*. The simple breath sounds are taught first and after awhile the vowels.

The theory of teaching mechanical speech is this: The organs of speech, placed accurately in certain positions, can, when breath or voice is allowed to pass over them, produce only certain sounds. The little deaf child's lingual, labial, buccal and pharyngeal muscles are stiffened from disuse. These muscles must be limbered up by a system of gymnastics before fluency can be expected. Miss Avondino will demonstrate to you the initial steps in speech teaching. She has a method of her own, which for want of a better term, we call "babbling." This method is based as nearly as possible on a study of the habits of little hearing children in acquiring speech. The infant goes through the whole gamut of sounds before uttering one word. He puts these sounds into syllables, and "goos" and "moos" to himself as he practices the exercises preliminary to speech. The deaf child is taught to do this. All babbling is encouraged and speech based upon it as in the natural method.

(Miss Avondino then demonstrated a congenitally deaf child of 8 years, who had been under instruction for ten months. The early steps in the child's education were shown, to give an idea of how such children are instructed in the beginning. She had the child give the elementary sounds of *wh*, *f*, *p*, *t*, and *k*, and then *a* (*r*), *aw* and *oo*. These were combined and the child gave:

fa(r), fa(r), fa(r)
 pa(r), pa(r), pa(r)
 ta(r), ta(r), ta(r)
 ka(r), ka(r), ka(r)

In the next step were developed final consonants in combinations, as:

a(r)f, a(r)f, a(r)f
 a(r)p, a(r)p, a(r)p, etc.

Then the vowel was changed and the child gave:

faw, faw, faw,
 paw, paw, paw, etc.

and also:

awf, awf, awf,
 awp, awp, awp, etc.

Then the child gave *ou* alone and in combinations.

So far the drill had been merely a syllable drill. Now the child was ready for a word developed from the syllable drill. Miss Avondino gave the word *cow*, which the child easily understood and repeated correctly in speech. Having previously learned to recognize the word from the lips the meaning was easily associated with the word, as the child herself spoke it. Several other words were similarly developed; for instance, kodak, elevator, etc., words with which the child was absolutely unfamiliar. By following the syllable drill method, Miss Avondino showed how whole sentences could be easily and smoothly repeated by the pupil. A few exercises were given to illustrate the use of Miss Barry's Five-Slate System in the development of proper language forms.

This child in her first session at school had acquired a vocabulary of over 600 words. She had gained such facility in lip reading and speech that she understood from Miss Avondino's lips and repeated a story of ten sentences. She also understood a number of questions of different natures and answered correctly.)

The use of rhythm with hearing children has only within recent years been given its due attention; but the fact has come to be realized among educators that rhythm is one of the most important factors of living. Almost everything we do is governed by rhythm of one kind or another. Through lack of hearing the deaf child misses a great deal of the influence of rhythm. This lack must be supplied. We do supply it in gymnastic exercises and also with music.

In beginning work with deaf children the first step is to teach them to feel vibration. They learn easily to tell the difference between the vibrations on the box of a guitar when the low string is struck and when the high string is struck. This is preliminary to their feeling the vibration of the human voice in the larynx. With the piano the keyboard is divided into three different registers, the low, the middle and the high, and the child learns rather easily to distinguish between them. This is possible, not only through feeling the vibration in the piano case, but through the floor at a distance of several feet. Next the children are taught to count as the piano plays in different tempos. Many of them learn to change from one time to another so accurately that they do not miss a single beat. They also become proficient in recognizing tunes. This music work is utilized for the purpose of tone regulation in the voices of deaf children. One great fault with the speech of deaf children has been its monotonous quality. Through feeling vibrations of notes in different pitch they come to an understanding of the production of different tones. They are taught to sing the scale. While it cannot be claimed that their notes are absolutely accurate, it is certainly true that they are able to produce the full octave and more and that they do incorporate into their speech the quality of variety in tone. If Dr. Goldstein will go to the piano, we will show you the different steps taken in developing this work, and I am sure you will be much interested in hearing these children "sing" in perfect time and rhythm to the piano accompaniment, though, as you will see, they are not able throughout to follow the tunes. One of the most interesting and important uses of musical vibration work with the deaf children is gaining the proper accent for words. Will some one in the audience suggest a long, unusual word for one of the children to pronounce, after having the correct accent suggested by the stressing of a certain chord on the piano. (The words "otolarynology" and "laryngological" were suggested and pronounced with proper emphasis.)

It must not be thought that school work for these deaf children consists merely in speech and lip reading. They are carried through a regular system of instruction, based directly on that of the public schools. They have their lessons in history, geography, arithmetic, just as hearing children do. They understand the questions of the teacher from the lips. They give their answers in speech. They are not able to go as fast as hearing children do, although one of these children, who is 9 years old, is progressing very nicely in fourth grade work, corresponding to the fourth grade in the St. Louis public schools.

(Miss Avondino then demonstrated with a child 10 years of age, who had lost her hearing at 4 years. This little girl had been in school just one year, but previous to this her mother had kept up her speech and trained her in lip reading. She readily answered a number of questions on the French explorations and early English settlements in New England and Virginia, and several questions on geography. These questions were taken from regular textbooks used in public schools. Persons in the audience were asked to give her questions, and she read several across the room.)

We have in connection with the Central Institute for the Deaf a school of lip reading for the adult deaf, and also what may be considered the most important factor, a normal class for the training of teachers of the deaf, in which teachers are equipped with the special training necessary for conducting the education of deaf children along purely oral lines. They are given a thorough course in phonetics, based on Dr. Bell's visible speech; a course of lectures in anatomy and physiology of the ear and vocal and respiratory organs; lectures on methods in speech and language teaching; and they are required to devote several hours each day to observation in the school room and practice teaching. Our diploma has been recognized by the superintendents of state schools all over the country, and we anticipate no trouble in placing in good positions all normal students who complete our work satisfactorily.

The work of educating the deaf is a work of reclamation. Left to themselves, the deaf would remain undeveloped. Placed in the schools of many states they are subjected to manual methods, which disregard or turn into small account any attempts at oral work. Some of our state schools are awakening to the realization of the possibilities of oral training and are fostering it, very often against odds. In other localities there is even opposition to oral work, and my appeal to you physicians,

who have here witnessed what can be done toward making deaf children as nearly like normal ones as their affliction will allow, is that you will investigate the processes of education for the deaf which are being followed in the communities in which you are responsible; that you will not be satisfied to leave this education entirely in the hands of those who are either ignorant of what can be done or antagonistic to innovations; and that you will prescribe intelligently, for every deaf child in whose behalf you are consulted, the sort of education you believe, after thorough investigation, to be best suited to that case.

ARE THE PROFOUNDLY AND INCURABLY DEAF
TO BE LEFT TO WORK OUT THEIR OWN
SALVATION, MATERIAL AND OTHERWISE?

H. B. YOUNG, A.M., M.D.

BURLINGTON, IOWA

I am aware that this question is, on its face, well nigh preposterous. From the knowledge which I have through a large personal acquaintance with my colleagues in otology, and that through familiarity with the records of the others, I should have such an assurance of their abiding interest in the welfare of those to whom medicine and surgery offer nothing, that but one answer would be possible, and that an emphatic negative. And yet, in spite of this, I expect to show that the question merits serious consideration. For, with the discovery that the deaf can be taught to speak, better or worse; likewise read the lips, better or worse; and this discovery fortified by positive assertions from those supposedly competent to speak with authority that the deaf may, by these means, be restored to society, this abiding interest has assumed the passive form. The field in recent years has been so completely occupied by educational specialists that even the policy of "watchful waiting" is not greatly in evidence. Moreover, the complacency which naturally follows a shifting of the burden to other shoulders has been but little disturbed by the fact that these educators are divided into two hostile camps; accusing each other of devotion to fad or chimera to the detriment of their followers; and openly fighting each other at legislative hearings on the disposal of appropriations for the education of the deaf. It has perhaps also been forgotten that the parents of the deaf child may, in the light of this conflict between the educators, some day ask why the hearing child has been so hedged about with medical inspection and the deaf allowed no such supervision. These are conditions, not theories; and if we would not have an affirmative answer to our question this abiding interest must again become active.

The claims and counterclaims of the two factions are important, mainly, as they represent or misrepresent the average of results attained. The exceptionally good result, here as elsewhere, proves nothing but individual adaptability. Before going into the merits of the case, however, we may glance for a

moment at the logical consequences of accepting unreservedly the dictum of either faction.

If the deaf child, reared properly in a purely oral environment, can, in due time, go to school (even college) with the hearing and is thereby restored to society; then all we have to do is to tax ourselves a little more for its preliminary education, after which we may express ourselves to this effect: "The average person labors under a handicap of some kind. Your handicap has been reduced to the minimum; therefore you are entitled to no special consideration." This syllogism may be faulty in that the middle term may not balance the major; but to question the conclusion one must question an admitted fact—the status of the deaf. If, on the other hand, an education, facilitated by the use of signs and with special attention to character building, is all important, the prospect that the deaf will be, more than they have always been, a class to and by themselves, is very remote.

In either event the deaf would be left to work out their own salvation, and this is the affirmative answer to our question.

Turning now to the merits of the case, we may note first that a general exception may be taken against the oralists and "combined system" people, respectively.

To the oralists' declaration that (1)* "a language of signs is unnecessary, but, if desired, can be learned at any age in a few months' time," there is the objection that the first part may be true in a limited sense only, and the last part in no sense. One does not acquire adequately, even in childhood, any means of communication without long practice; and without the sign language, lectures, sermons, general discussions and the benefits to be derived therefrom are simply out of the question. On this point I quote from one peculiarly qualified to speak, Mrs. Sylvia C. Balis, a deaf teacher of the deaf in the Belleville (Ontario) School. She says: "An expert lip reader myself, with many years' experience, I have never yet been able to follow an orally delivered address, nor have I ever, among the hundreds of deaf persons I have met, encountered one who could. At Delavan, Wis., three years ago, at the Convention of Instructors, Crouter, Booth and Archer were claiming its possibility when I told them that I had been unable to understand a word they had said, though near and in a good light. I called upon any deaf person in the audience who had followed the oral argument to arise. After some delay, one, a graduate of Crouter's school (Mt. Airy) said, *in signs*, that in all his years

at Mt. Airy he had never been able to understand or enjoy a chapel service or any spoken address."

To the declaration of the "combined system" people that, in properly selected cases, they make a premier showing of speech and lip reading and develop the natural talent for signs, as a necessary adjunct, not only to expression of ideas, but as well their acquisition, the objection may be that while the statement is technically true, oralism combined with signs may not create the speech habit but in its place the *word* habit by means of the manual alphabet—a habit which should be the exception and not the rule. Furthermore, it is not clear that the candidates for oralism are subjected to scientific tests.

The desire which is natural, and naturally common to both systems, to impart a thorough knowledge of the English language, probably accounts for some of the excessive zeal in both systems. Unfortunately for the "combined system," learning English by speech is, to the uninformed public (which includes much of the medical profession) the much more plausible way; and out of this has come the impression (I should not have to say, erroneous) that the manual alphabet, with a few accessory gestures, is the sum and substance of the sign language. Add to this the natural desire of the parents of the deaf child to hear that child speak, and the enthusiasm for oralism is easy of comprehension. The heart-breaking disappointment attendant upon the failure of that speech to meet the expectations is another story.

In these general criticisms and supplementary remarks, the scope of our inquiry is fairly outlined. Having now heard the educators say what can be done for the deaf, it remains to hear what the educated deaf say has been done; and, as both factions of the former are committed to oralism, differing only in the scope of its application, it is manifest that we may call to the witness stand none but the speaking deaf.

From the "cloud of witnesses" available I will call to the stand only the few needed to clarify the issue already alluded to as the only one of real import to us: the exclusion or establishment of misrepresentation in the educational schemes. These witnesses will not appear in person, but, to borrow a legal phrase, by deposition duly signed.

Miss Alice C. Jennings of Boston, until recent years a pure oralist, says: "It (the sign language) was like a new world to me. It seemed wonderful that such deep thought could be expressed by a few gestures and the spelling of a few words.

The study of signs has, I think, increased my own mental power. I have written more vividly, more pictorially, through having these pictured words constantly before my mind. Another great advantage in knowing signs is the relief thus given to physical strain. The best lip reader that ever lived cannot understand everything. When in sermon or conversation, signs and the manual alphabet are freely used, the meaning is not only rendered more clear, but the labor of getting hold of it is vastly lessened."

Miss Edith Fitzgerald, Delavan, Wis., B. A., Gallaudet, preliminary course at Northampton (purely oral), says: "It is, from observation, my opinion that the orally taught deaf are greatly in need of signs, for the very reason that I needed them. The sign language is the only resort in this broadening process. I know that if I had had signs when young I would not only be better informed than I am, but I would have had a happier childhood."

Isaac Goldberg, a well-known chemist of Brooklyn, deaf from seventh year but speech retained, graduate of the Institution for the Improved Instruction of Deaf Mutes (the great oral school of its day), and Gallaudet later, says: "After I left the oral school, and because of the unsatisfactory state of my knowledge, my parents put me under a private tutor who fixed me up in the three Rs. I do not feel that I owe my powers of speech and lip reading to the oral people, seeing that I had these faculties before I entered their school. It may have helped to develop these powers, but what I am today I certainly do not owe to my ability to speak and read the lips. However, I know positively that the learning I now have and which enables me to earn my living, I obtained from the manual school exclusively."

Further, in reference to newspaper exploitation, he makes these observations on pure oralism: "I have always insisted that if it is necessary that the public be advised of the merits of pure oralism, it is a matter of equal justice that it should be told of its weaknesses. And the Lord knows there are many, chief among which are, that the pure oralist knows too little of teaching the deaf to realize that a means suitable for one condition of deafness may be entirely inadequate and unsuitable for another; that an altogether inordinate value is set upon speech and lip reading for all the deaf; and, above all, that the cause of the deaf cannot be promoted by an empty, tottering framework, held together by the grossest frauds, covered over with the most vulgar sham and embellished with the meanest kind of deception."

F. R. Gray, Pittsburgh, a lens maker and amateur astronomer of note, says: "I am unalterably opposed to the pure oral method being made compulsory in any school. Wherever this has been done the effects have been deplorable in numerous cases. Only last summer I saw for myself some unfortunate deaf pupils who had spent years in a pure oral school and never learned a single word. They had been recommended by their oral friends as fit subjects for an imbecile asylum, being incapable of learning anything. Now mark this. These children, from 14 to 16, with their best years wasted in an oral school, learned with surprising ease and swiftness in a school where signs were used and are in a fair way of getting at least a partial education that had been denied them by the other method. The sentiment of all the educated deaf is similar to mine. They know, for they have been through the mill. The oral advocates have only theory, for neither they nor any hearing person can put themselves in the place of the deaf and understand their limitations."

J. C. Howard, Duluth, investment broker and president of the N. A. D., says: "The deaf, as well as the hearing, are entitled to learn all they can by such methods as are most expeditious. I speak, and when people do not expect me to do so I read the lips, but I feel that it is my right to come by knowledge in whatever way God has given me, since it was His good will that I should not hear. Speaking as an observer of methods of teaching the deaf, I wish to say that I have personally visited some twenty-eight schools for the deaf, both combined and oral, and I have tried to judge results with an unprejudiced mind. I will say frankly that I am amazed at the inefficiency of oral schools. I have seen one of the teachers of the higher classes in one of these schools tell his pupils a simple story, and the only part of the story they were able to write out were parts where he made signs during the course of his narrative. Another thing is the curious fact that at conventions of teachers of the deaf there are invariably a large number of graduates of combined method schools who take a keen interest in the education of their class, but who are not teachers. I have yet to meet an orally taught deaf person at one of these conventions who came there to urge the advantages of the oral method. Are these orally taught deaf so completely restored to society that they have lost all interest in their deaf brothers and sisters, or is there some other reason for their nonattendance? I asked Mr. Booth to please enlighten me while at Delavan last summer, and he said that he admitted the fact that they did not attend but could not tell me why it was.

To get down to the utility of the question, what good would lipreading do me? Suppose I were one of those marvels born with a quick eye to read the lips, would I dare employ lip reading in business affairs? I say I would not. If a dispute arose as to the understanding of an agreement, what court of justice would affirm that a mere lip reader better understood any given conversation than he who could hear? On the other hand, what court would not accept written evidence in preference to verbal?"

Edwin A. Hodgson, M.A., for thirty years editor of *Deaf-Mutes Journal*, New York, says: "No one will blame a mother for desiring, above all things else, that her child shall be trained to enunciate written or printed words. No one can convince a loving parent that a few words spoken by her deaf child is not a real demonstration of educational progress. Sometimes it is and sometimes it is not. As one of the street car advertisements says: 'You can teach a parrot to say "Just as good," but the parrot won't know what it means.' The truth is that mental comprehension of things, and a proper understanding of the import of words and their grammatical connections, must precede verbal expression in order to give that expression any value. The pure oralist says that the sign language is a deterrent to success in oral accomplishment. He does not seem to know that the reading of lip motions is just the same as the reading of finger or arm motions. All are simply signs, without any tone or sound whatever. The writer has had fully forty years of experience as a totally deaf man. Not a sound in all these years has broken the eternal stillness of his life. Yet he speaks so that people understand him, and reads the lips with negative ability. He believes the sign language to be the greatest boon to the deaf—next to books and the 'movies' the most lucid interpreter of thoughts that educate and give pleasing satisfaction to the silent wayfarer along the journey of life."

J. H. Cloud, editor of "Public Opinion" in *The Silent Worker*, says: "The aggressive activity of the oralists is in a great measure the WHY of the N. A. D. with its present membership of over 1,000. The unwarranted claims made for the oral method in the public press, and the lobbying for special laws favoring that method must be counteracted and that entails a burdensome tax on the resources of the N. A. D. The oral association has an endowment fund of \$100,000 and other property valued at probably as much more, all of which is practically the gift of one man whose hobby is the teaching of the deaf to speak. With

such valuable resources the oralists have a tremendous advantage when it comes to influencing public opinion in favor of their method, by means of magazines, pamphlets, press articles and agents. On the side of the deaf there is at present little more than the righteousness of their cause."

To this personal testimony should be added the resolutions unanimously adopted by the Nebraska S. A. D., calling for the repeal of the law making oralism compulsory in the Nebraska State School (the only state having such a law, although in Pennsylvania there is a stipulation about the availability of appropriations which might be construed that way).

In the light of this evidence, any statement that the efficiency of pure oralism is beyond academic discussion must appear premature. Such a statement may be even more than premature if we are compelled to accept as fact the positive assertion of some of the men just quoted that the deaf of America where the sign language is so jealously guarded, are educationally superior to those of the European countries where oralism has so long held sway.

However much, therefore, we may severally be in doubt about the merits of this century and a half old controversy (to be exact it was in 1760 that Del 'Epee showed the fallacy in Heinicke's doctrine) over methods to which the acid test (a systematic comparison of results) has never been applied, we may see from the manifest unrest among the educated deaf that it is high time for us to insist that scientific measures shall supplant the "rule of thumb" in determining the deaf child's capabilities. We can do no less and be consistent. Medical inspection of schools for the deaf is peculiarly necessary. But our province does not end here. That abiding interest in the welfare of these unfortunates, which we profess, is but a mockery if we confine it to their material welfare. Their social and moral welfare must be provided for if they are not to be denied that last great inalienable right of the American Magna Charta. However necessary education may be to the material welfare of the deaf, as also the hearing, it may contribute but a moiety to happiness. For this, association is all important; the privilege and ability to communicate with one's neighbor on terms of reasonable equality. Looking at the situation squarely it resolves itself into this concrete proposition: If we have the right to expect the deaf to cultivate speech and lip reading, a most difficult undertaking for them, they have the right to expect us to cultivate the sign language (their mother tongue), a comparatively simple task for us.

In a paper which I had the honor of reading in the Otologic Section of this Academy last year I presented an argument which led to this proposition in a different form. It was largely a consideration of the question in the abstract and as the argument was necessarily condensed to meet the time limit, it met the fate so common to the new issue on a first hearing. In marked contrast with this reception by colleagues was that by those conversant with the facts cited and the conditions portrayed. From Henry W. Rothert, superintendent of the Iowa School for the Deaf, and Dr. E. H. Currier, superintendent of the New York Institution I had unqualified approval; and President Howard of the N. A. D. wrote me at length, beginning with these words: "I have been much interested in your (proposed) address before the Academy. I can say without hesitation that the deaf people of America will hail it with delight, and would beg that it be made a part of the literature of the N. A. D. to be distributed in pamphlet form. It is indeed gratifying to have a medical man treat a subject like this from a commonsense standpoint and urge an attempt at the practical rather than theorize on an impractical proposition."

The press notices in the literature of the deaf have also been distinctly favorable. Here is one from the *Companion*: "It is an article that can be read with profit by every educator of the deaf in the world. It gives the views of an impartial observer and student who has no axe to grind, but seeks to discover the truth and make it known. The article is especially recommended to those who are inclined to go to extremes in one way or another in the education of the deaf."

These people have, of course, had an additional advantage in that, while considering my proposition, they were not limited to the eighteen minutes prescribed by the rules of this Academy; but that I have raised a real issue must be manifest from the fact that I have excited the two extremes of comment. Moreover, in advocating the general acquisition of the sign language for the betterment of the social condition of the deaf I may have emphasized the lesser rather than the greater benefits to be derived from it. This is outlined in my closing discussion where I spoke of it as the plain road by which the deaf would be incidentally and therefore more effectively helped; and then cited the experiment of the Los Angeles school teacher who, like me, although independently, was impressed with the logic of events, in this particular field.

Thus the assertion that my proposition contains large economic possibilities seems wholly within reason. This is a cosmopolitan country, the "melting pot" of the world, with a large foreign population, much of which is, after years of residence, still assembled in communities where familiarity with our customs, laws and language is not cultivated; and much of which, especially that from Mediterranean countries, is adept in the sign language. How much easier it would be to assimilate this population if we could communicate freely with these people of whatever language as our deaf friends can and do on occasion. For instance take the case of the totally deaf man in a Pennsylvania steel mill, who acts as interpreter for the workmen who cannot speak English. The only wonder is that this object lesson should have been ignored so long. Think of it! Fifty thousand Americans, whose social relations with their fellow citizens hang by a thread so feeble that they fear to trust it, still able through the despised sign language to meet multitudes of the foreign tongued on practically even terms! In the popularity of the "movies" and Miss Reeves' demonstration in her Los Angeles school we may see the trend of the times, although yet unrecognized by those who give it force. Under such circumstances we can well afford to advocate the systematic study of the sign language.

But its advantages to the deaf alone are worth while. With 95 per cent. of them self-supporting, useful citizens, and no mendicants in the other 5 per cent., it will be difficult to find a class of people to equal them in efficiency. Indeed, so jealous are they of their good name that they have secured in some states, and are working to that end in others, the enactment of a law making it a misdemeanor to solicit charity on account of deafness; and for its enforcement they pledge their expert service in detection. Individually they have, perhaps all, appealed to us directly to relieve them from their affliction. The indirect appeal to help them get what they want, as they want it, should be no less binding, if we are to keep bright on our escutcheon the word altruism.

DISCUSSION

MISS GERTRUDE TORREY, Chicago:—A few questions are always asked about lip reading for adults. First, How long does it take the average person to become fairly proficient in lip reading? There is a great difference in individuals, due chiefly to the type of mind. Some find it much easier to learn than others. I think three or four months is the shortest probable time, and six months to a year or more is not unusual.

Almost any one can learn to read the lips well enough to understand his family and friends, and many become expert enough to follow lectures, sermons and plays.

As to the age at which one should begin the study, I think it is better to begin any new study when comparatively young, but often people of middle age or older get along very well.

I have been asked if I use a textbook. I use the Nitche method and textbook. It is better to learn lip reading with a teacher, but sometimes it is learned at home, and directions for home study are given in the textbook. The most important point is a great deal of the right kind of practice.

In teaching adults we omit as much theory as possible and give the time to practical lip reading. There is a great difference in teaching adults and children. Deaf children have to be taught all the elements of speech, articulation, etc., as well as lip reading. Adults who become deaf already have all these things, and only have to learn lip reading.

A MEMBER:—What handicap do you find in teaching lip reading to one who has learned the manual?

MISS TORREY:—Personally, I have had almost no experience, but I think it might be hard.

MISS MARY McCOWEN, Chicago:—At this late hour, an adequate discussion of the problem presented before you this morning is quite impossible. I simply bring you greetings from Chicago. Referring to the demonstration, I commend it heartily. By virtue of my long years of service in this particular work—the oral and aural education of the deaf—I feel justified in assuming that no one in this audience can appreciate more fully than myself the arduous task of the teachers who prepared this exhibit. Such work requires enthusiastic devotion and untiring service. I rejoice that this demonstration was presented in Chicago and that some of the patrons of our Chicago public school classes for the deaf have thus had an opportunity to see and to hear what has been accomplished for this group of deaf children.

Referring to the New York school for the deaf so ably represented here today by Dr. Harris Taylor, I am reminded of a bit of ancient history accidentally discovered by me when searching the dusty records of the early Proceedings of the Chicago Board of Education, namely: the gentleman who, as Dr. Taylor related, organized the private school in New York City over which the doctor at present presides, did an earlier work in the West and went to New York from Chicago. While in this city, Mr. Greenberger was allowed to occupy, without expense, a room in one of the Chicago public school buildings, where for some time he conducted a small private school until driven out by the great Chicago fire. In this case, Chicago's loss became New York's gain, and progress thereby established a new record in that it moved from the West toward the East.

Referring to the Chicago situation in which you will no doubt have a deeper interest because of this morning's demonstration, I am glad to say: Organized in 1875, using the hand language exclusively for many years, inoculated with the oral method in 1896, the Chicago schools for the deaf, today, by choice of the parents, use only the oral method. Classes with an attendance of about 300 deaf children are located in three centers on the different sides of the city, housed in the regular public elementary school buildings as a recognized part of their work. Children who complete the elementary course are admitted to the regular high schools for hearing children, and a training class for teachers of the deaf is conducted in the Chicago Normal School. Free classes in speech reading for adults becoming deaf are conducted as a part of the regular public night school work with a present membership of about eighty. The parents of deaf children have a strong central parent teacher organization with local branches at each center.

This deep interest in speech and speech reading for the deaf in Chicago, and the widespread use of the oral method here, reaches back to pioneer work begun in this city thirty-two years ago this October, by a small private school which at that time opened its doors to very young deaf children. Pioneer oral work for the deaf was for years an unwelcome experiment in the Middle West, but in spite of adverse conditions, this little school with its band of earnest devoted teachers who would not admit discouragement, achieved results which brought world-wide recognition and made a permanent place for its work. In 1896 its advanced pupils with their teachers and later in 1905 its training class for teachers were by request, transferred to the public schools. This school had an important share in creating a more just public opinion regarding the deaf and in establishing a higher standard for their educational attainments. Much has thus been accomplished in Chicago during the past thirty-two years, but much yet remains to be done.

Probably no one will question the statement that a private school has always one advantage over a public school in that it can control its own conditions and is alone responsible for the advancement or failure of its pupils. Since the deaf child in the public day school is with its teacher but five hours on school days and spends the balance of the twenty-four hours on these five days and the entire time on two days of every week at home or on the streets, it is manifest that the future success of the work so well begun in Chicago must depend largely upon the intelligent cooperation of the home and the community with the school. This cooperation we cannot compel, but may reasonably expect in increasing measure. And not the least important factor in this cooperative scheme is the physician who by virtue of his intimate relations with the family has usually an early opportunity to discover deafness and is called upon for advice. May we not hope that the interest manifested in this morning's demonstration by this large body representing the best professional skill of the country bespeaks a near future wherein the physician will more often perform an important part in the education of the deaf, by early pointing out to parents whom it is his privilege to advise, the advantage of careful early training and teaching for their deaf child? On behalf of the Chicago public schools for the deaf and the children whom they serve, we solicit the interest of Chicago physicians.

DR. HARRIS TAYLOR, New York:—This is the first time in my life that I have ever anticipated any pleasure or desire to meet physicians in a professional manner. Heretofore I have met them in bodily pain. Today it is different, and instead of absorbing medicine and advice and doubtful compliments, I am expected to radiate information.

I shall feel it my duty to lay before you a little more clearly the difference in methods that exist in American schools for the deaf today. A young lawyer in Indiana, pleading a case before the supreme court, was indulging in points familiar to a school boy. The judge said, "You may assume the supreme court knows and understands the fundamentals of law." He replied, "I once lost a case by assuming that." So I shall assume you know nothing at all.

First, there is the manual method, which uses the sign language and the finger alphabet.

Second, the manual alphabet method, which uses the finger alphabet to the exclusion of the sign language.

Third, the oral method, which uses speech and lip reading and which excludes signs and finger spelling.

It is well to bear in mind that there is a radical difference between what is known as the sign language and the finger alphabet. For instance, for *butterfly*, using the sign language, you would make motions describing the movements of the insect. With the manual alphabet, you would spell out the word letter by letter. The manual alphabet is English and corresponds very closely to written English. The sign language is not English and does not correspond with English in either idiom or grammatical structure. Stated in another way, we may say that the methods of instructing the deaf in America may be classed as silent or oral, English or foreign, or mixed.

Silent methods may use either the sign language or the manual alphabet. Oral methods use speech and lip reading. English methods may use either the manual spelling or speech and lip reading, or both. Foreign methods use sign language, which is not English. Mixed methods may use all of these.

Of these methods, the silent method, being a combination of the sign language and finger spelling, first found lodgment in the United States. This method was soon found unsatisfactory, because it was discovered that children who had recently lost their hearing, would often lose their ability to speak within a few years after entering a school for the deaf.

The oral method was successfully introduced much later. This was largely owing to pressure from parents who insisted upon a method that would preserve the speech of the child.

The oldest existing oral school for the deaf in the United States—that is, the first school in which speech and lip reading were used to the exclusion of signs and finger spelling—is the Institution for the Improved Instruction of Deaf-Mutes, now located at 904 Lexington Avenue, New York.

The oral method did not receive the most cordial support from the profession; neither did it from the deaf who were taught by silent methods. The statistics of the growth of the oral method in the United States would be exceedingly interesting, and I should be glad to go into them if the hour were not so late. During the last twenty years particularly the growth has been very pleasing. In 1894, 25 per cent. of the children in the schools for the deaf in the United States were reported as being educated by the oral method. In 1914—twenty years later—69 per cent. of the children in schools for the deaf in the United States were reported as educated by this method. Of the children educated by the oral method, one third were in oral schools and two thirds in what are known as combined schools; but these children were taught by the oral method. The growth in the number of oral schools has been very remarkable. The total number in 1904 was eighty-two. In 1914, it was 154.

Let us take a specific school to illustrate the growth of the oral method. In the 80's, the Pennsylvania Institution for the Deaf and Dumb began the experiment of educating some of its pupils by means of speech and lip reading. Two classes of children were segregated from the other children of the institution. The progress of the oral class was watched and compared with the classes taught by the silent method. The basis of judgment was not the amount of speech and lip reading that the children acquired, but the ability to use the English language. Twenty years later the oral department had grown materially, and the silent, or manual, department had only two classes. In 1906, only a few years later, the authorities of the Pennsylvania institution decided that the two manual classes could be dispensed with, and the school became an oral school. The question is, What was the effect on the standing of the Pennsylvania institution? Within this time this insti-

tution materially increased the standard for graduation. From every point of view the Pennsylvania institution is regarded by all as one of the very best in the world, and by many as the best in existence.

Today the best work and the greatest mental attainment are found in either oral schools or in the oral department of the combined schools.

For more than twenty years the schools for the deaf in the State of New York have been under the direction of the State Board of Charities and the State Department of Education. Both of these departments send competent inspectors to investigate the work of the various schools for the deaf from every point of view, and their reports show conclusively that the oral schools of New York stand at the front in the attainment of the pupils from every point of view; and, in addition, these pupils have a greater command of spoken language, have greater ability to speak and read the lips than may be found among pupils taught by other methods.

DR. F. PARK LEWIS, Buffalo:—I will say in the first place that if the President's address is included in this discussion, I want to say a word in regard to that. You all know the work that has been done in the conservation of vision. There is no doubt that the conservation of hearing is as vital a problem and that there is a large number unnecessarily deaf as there is of those unnecessarily blind and consequently comes within the province of this Academy to take under consideration measures for some such campaign for the conservation of hearing as for sight, and I hope a committee may be appointed for the purpose of carrying out the suggestions not only of Dr. Beck, but of those involved in the general plan for the conservation of hearing such as is now being carried on for the conservation of sight.

In regard to the discussion of papers that have appeared, it not infrequently happens that the by-products are as important as the main thing, and that which has impressed me most is the good pedagogy employed. Not only have the children appeared before us as mentally keen and alert as those who have hearing, but they for the most part are keener and that is to be expected. Some years ago I had the pleasure of seeing some work in various schools for the feeble-minded and I said at that time I would be very glad if my children could have the opportunity of attending a school for the feeble-minded, because the methods adopted for those mentally slow are doubly efficient for those mentally normal and I find that holds good for those who have defects of sight or hearing. I would like to speak about the development of various brain centers through the association fibers brought about by being in touch with the several senses through the activity of other senses, as, for instance, the rhythmic sense as shown in the piano and the color sense as shown in the association of colors. We must remember that the various parts of the brain are connected by bundles of fibers bringing into play various centers and that our conception of objects in space is manifested by the combination of all those activities. When I hold an apple in my hand and by the sense of sight and form and by the memory of taste I have had activated groups of centers and excited a flow of neuricity going from combination to combination. We can readily see we are in that way developing the brain centers that are not otherwise activated by reason of these associated fibers. I wish to particularly emphasize the responsibility of those of us who understand the value of this method of teaching to urge its wider use in our public schools, and to impress upon our teachers the necessity of bringing under its influence those who are now allowed to struggle along in classes for which they are unfitted to their own detriment as well as

that of their school fellows. The partially deaf children should be segregated and given the proper instruction to fit them for the activities of life. When the association for the conservation of vision was taking up the question of illumination, we had a letter from a superintendent of a school for the deaf. He said, "We are building a new school for the deaf, how shall we light that school so that the pupils can use their eyes with the least effort?" That suggested the need of examinations of the eyes of the deaf and their correction with glasses when necessary, as their eyes must in so large a measure take the place of their ears.

DR. G. THOMSEN-VON COLDITZ, Chicago:—In my experience lip reading is of far greater benefit to the deaf than the one of signs. The sign language can only be used to a very limited extent, while the lip reading enables the deaf to communicate with all the world. One of the reasons that lip readers do not understand everything is that they have not been properly taught. I had two patients, husband and wife, where the wife could understand very little and the husband everything. The wife had gone to a public school in Chicago and the husband had had his education in Germany. The husband was 20 years old when he came to this country and after being here for a number of years, without any instruction in English, he was able to speak English, and was very easily understood and could understand everything I said to him. He was totally deaf. The parents had two children with normal hearing.

DR. H. A. BEAUDOUX, St. Paul:—I rise merely to move that a vote of thanks be extended to Dr. Goldstein and the ladies and gentlemen who came here to give us such an entertaining illustration of their work in this particular line. We have two small schools in St. Paul, which are doing good work. The first revelation that I had concerning their method of lip reading was one day when a young lady presented herself at my office seeking my assistance in gathering cases for instruction. I conversed with her for fully an hour, and was perfectly astounded when she informed me that she was almost totally deaf. Such cases and results as shown here this morning should convince the most skeptical of the immense advantages these people have over those who resort to artificial hearing apparatus or loud talking and even the conspicuous sign language.

DR. H. G. SHERMAN, Cleveland:—I feel that Dr. Goldstein is deserving of our appreciation in bringing this matter so realistically to our attention. I think perhaps we have been dilatory in not recognizing its importance sooner. None of us can fully understand that the deaf are the most afflicted of all those who suffer from mental or physical defects. This is brought very acutely to mind by those who observe in the adult, and especially in women who are perhaps more emotional than sentimental, that they so keenly realize their handicap by exhibiting moroseness or becoming exceedingly jealous and suspicious, so that in association with their friends and relations, not knowing what is being said, feels deeply this disability. I beg to express again to Dr. Goldstein, and all those who are concerned in bringing a renewal of interest to us who are engaged in this work, our profound gratitude.

DR. W. C. TUCKERMAN, Cleveland:—One point has not been brought out which I consider the most important. This presentation has demonstrated that lip reading is possible and practicable. Now, although it is no better than the sign language as a means of communication, it has this advantage that with it the deaf can communicate with normal individuals, and this they cannot do with either the alphabet or sign language, as few normal persons will take the trouble to learn them, and thus the deaf are practically isolated from the rest of the world.

DR. JOSEPH C. BECK, Chicago:—I will say that the Academy and I owe their appreciation of this meeting to Dr. Young, because it was his paper to which I took so strong an exception in Boston, that the result has been accomplished to my satisfaction at least and the majority of the members. On returning from Boston, Dr. Young called at my office in explanation of his paper, and I found that I had made a serious mistake in discussing that paper, and that I had made him and perhaps may have made all think that I believed the sign language was to be buried and no more heard of. It was not my intention to give this impression. Nor do I think, even though the discussion seems to show that everything is in favor of oralism, that everybody believes the sign language is to be banished, because of the very fact that the lips and the shrugging of the shoulders are a part of the sign language.

If you notice the teachers who are demonstrating here you will see that they do use signs. I do not want to make any apologies for Dr. Young, but I want to say that I am not entirely converted to pure oralism, and if I were an expert in this line, I would say that a good deal of the combined methods is the best for the average man who has to make a living. Then I would like to recall one of our great teachers, Dr. Blake, in Boston, who called attention to the morose disposition of the deaf, and this, as you have seen in these children, has been removed. Here is a deaf mute, a pupil of Miss McCowan, and here is another lady. This young man has improved in health. He had a suppurative labyrinthitis from measles. And the young lady here had a double suppuration and bilateral operation. Now the operation did not help her speech or her ability to get employment, so we must take that into consideration. Consider the Edelman tuning forks as a means of helping to educate the deaf. I want to say as late as two weeks ago I had to go to St. Louis to get this symposium arranged, and if you want to know the truth I arranged the work for Dr. Goldstein, and I am glad that it has been successfully demonstrated.

MISS TORREY, Chicago:—As you are all trying to solve some of the problems of the deaf, I would like to speak of the New York League for the Hard-of-Hearing, which was organized some years ago for the purpose of helping the deaf and hard of hearing in all ways possible. It is not connected with any school, but is a philanthropic organization under a board of directors, some of whom are aurists. It offers social intercourse to the deaf. It has an employment committee which finds employment for those who wish it. It sells the productions of the members. Work is sent from many parts of the country to be sold in "the shop." It makes loans and gives scholarships in lip reading. Some of you may have patients whom you would like to put into touch with the league. It will help them to help themselves.

DR. TAYLOR, New York:—I would like to make a few remarks bearing somewhat on the paper of Dr. Young, and would say very candidly, that I do not fail to appreciate the merit of the sign language; but I do not believe that the sign language should be used for the purpose of instruction, as a means of communication between teacher and pupil. It has been demonstrated that to confine the system of instruction to speech, lip reading and writing is more advantageous in putting the child through his school life, and we find more and more that this brings about the most desired results with the least effort. The question of the sign language among the deaf after they leave school is a question that they must solve for themselves. What I am attempting to do is to prepare the deaf for the easiest and most effective communication with the hearing world, where they must earn their living.

I wish to state that the school which I represent, the oldest oral school in the United States, has been instrumental in forming a society for the welfare of the deaf, and, in addition, this institution has assisted in the establishment of an employment bureau, through which the deaf may obtain positions. This bureau has kept statistics of the persons who have applied for work, and has found out statistically that those who can speak and read the lips have a greater earning capacity than those who do not; also, that, broadly speaking, all other things being equal, the earning capacity is in proportion to the readiness with which the deaf can speak and read the lips.

DR. YOUNG (closing):—In closing the discussion of my paper last year, and of which there is unaccountably no record in the printed Transactions, I found it necessary to emphasize the fact that oralism as an accomplishment was not under question. To concede that it was an accomplishment, and I conceded it, in no way affected by argument; for I urged a measure, profitable alike to the hearing and the deaf and including those, however many or few that oral teachers despair of helping. Had more time been allowed me I would have presented documents confirmatory of the statements made. But it is perhaps better that these should have been reserved for today. There are advantages in the second hearing. The temerity assumed, when one advocates a sort of *volte face* in matters supposedly scientific, may be forgotten in the presence of concrete facts, supporting the new departure. From some of these documents I have quoted freely, and two others are here available for general inspection. Had the teachers of the sign language, instead of depending on a showing of results in contrast with those of a hundred years of oralism in Germany, given public demonstrations of its comprehensiveness and systematic construction, my campaign of education would be unnecessary.

To convert any considerable amount to my way of thinking may take more than this presentation. Credé's epochal discovery was twenty years coming into its own; and the spell of the scientific in oralism, worked as it has been by its promoters to, and even beyond, the limit, may for a time cloud the judgment in this. But the independent and general investigation heretofore neglected, and which I now confidently anticipate, will eventually bring the conviction that the hearing of the deaf is paramount and they know best wherein that lies. It will also, and this is the answer to my critics, uncover something already accomplished. Besides the entering wedge driven by Miss Reaves in the Los Angeles public schools, there is the conversion of the Boy Scouts and the Camp Fire Girls; and the N. A. D., now 1,200 strong, has inaugurated a campaign of organization to this end. So I may conclude with this further prediction that when this "clown" language (Dr. Glogau's expression) is abolished, the theaters will be dark and the phonograph do all the public speaking. But this will not be in our day.

DR. GOLDSTEIN (closing discussion):—Let me thank you in the name of the teachers and all those who have come here for the vote of the society and for your cooperation and interest. If we were talking fifty or seventy-five years ago I would take extreme pleasure in discussing Dr. Young's paper, but we are living in the present and we are progressing in the education of the deaf as in other large civic movements. America is not alone in the civilized world in promulgating a system of this kind. Germany today, and we all take our hats off to her, has 100 per cent. oral training; there is no such thing as the sign language in Germany. Little Norway has 100 per cent.; others over 80 per cent. Russia, more

or less benighted, still has a greater percentage of oral training than we have, and as Dr. Taylor said, the last census of 1910 gives 69 per cent. oral training. America has still some progress to make before we are recognized as keeping pace in all respects with training defective children. I do not want to make any further comments. I have said all I want from our section of the country and the work of our little pupils speaks for itself. There is one thing that I ask for, not thanks, not appreciation of something we have done, but cooperation, and we are not going to get results in this work until you fellows put your shoulders to the wheel. I hope and pray the day will come when you will help us out in this great cause.

DEATH ATTRIBUTABLE TO INTRANASAL OPERATIONS AND OTHER INSTRUMENTATION

A CRITICAL REVIEW WITH REPORT OF EIGHT UNPUBLISHED
CASES, ONE PERSONAL

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That death should follow cauterization of the nasal mucosa, or after diagnostic puncture, irrigation or perfusion of the antrum of Highmore is surprising and not to be expected, as thereby violence is not done any vital structure, nor are any channels laid open for the transmission of toxic material, especially as in the latter instances death was almost instantaneous. On the other hand, it is still more surprising that more deaths do not occur after such instrumentation as probing the various sinuses, the attempted introduction of cannulas and the curettement of them, or from operations on those structures and the bony septum, when their intimate connection with the cranial cavity and the meninges is recalled, not only through the medium of the blood vessels and lymphatics, but also by actual continuity of tissue. Moreover, when it is considered that removal of the middle turbinate, itself but a wing of the ethmoid labyrinth, lays bare numerous new channels for the transfer of infective material straight to the meninges by way of the porous and poorly resisting ethmoid, the ensuing death should never surprise, however much it may distress the conscientious attendant. Similarly, the removal of nasal polypi is singularly free from danger, as a rule, when it is fully appreciated what their presence signifies, as it is fairly certain that the periosteum always and the subjacent bone nearly always are diseased. Consequently, to disturb this necrotic area with the added hazard of trauma (as most polypi are thus removed: avulsion) must set free infection in the presence of new areas for absorption in a region that is always dangerous, the middle and superior straits of the nasal chambers. The most elementary knowledge of anatomy would cause appreciation and respectful consideration for the dangers of any operation on the bony nasal septum, especially any that encroached upon the ethmoid perpendicular plate, and the radical frontal sinus operations are so

obviously critical that deaths from this latter class are not even considered here, save in one case, where the fatality was directly due to the removal of the middle turbinate and disturbance of the ethmoid in the presence of an acute suppurative ethmoiditis and frontal sinus empyema. When infection does occur it is to be accounted for not only by the virulence of the bacteria, but also by the laying open of wide venous and lymphatic spaces with their free communications with the subdural and epidural channels. The intimacy of this relation has been shown clearly by Schwalbe, Michel, Key and Retzius and Cunéo and André, who severally show that the cribriform plate of the ethmoid is the point of communication between the nose and the dural spaces, either by the venous or the lymphatic route, and by the fibers of the olfactory nerve. Logan Turner is rather skeptical as to the responsibility of the lymphatics for the spread of infection in the nose, and he quotes Gerber, Gyselynck, Meyer, Hoffmann, Hogue-nin, Ogston and Warner, all of whom report a series of infections from empyemata of the accessory sinuses, which would seem to show, in the main, that the lymphatics conducted the toxin less often by far than any other method. Ortmann's case, for example, reveals the infection as spreading by continuity of inflammation through bony walls.

The comparative freedom from fatal infection following operations within the nose has encouraged considerable speculation and theorizing as to the cause of this immunity, some of which are as follows: a special bactericidal power on the part of the nasal mucus,² that it is a poor culture medium for bacteria,³ its mechanical function in agglutinating the bacteria and preventing their activity.⁴² Certainly the film of thick secretion that exists over the nasal mucosa does act as a protective curtain against dust and other foreign bodies, and it is not entirely unreasonable to attribute this same effect where bacteria are concerned. However it may be construed, we know that regions which are necessarily exposed to trauma and infectious agents are by Nature afforded greater powers of resistance than elsewhere in the body, and the nasal mucosa is peculiarly active in this respect. While it might be supposed that the use of cocaine would obscure the etiology of these fatal cases, yet not one could be fairly stated as due to its use, though Claus gives it as the cause of his two cases.¹² However, there can be no doubt but that the use of adrenalin⁴ was directly the cause of several fatalities, one of which I will give later, as a personal observation in the hands of a colleague in this city. The number of authors who have testified to its dangers

is great, and Lermoyez and Aubertin have tried to eliminate the peril by fixing the amount that is safe to inject in nasal operations. Such an attempt is futile, inasmuch as an idiosyncrasy for the drug might prove fatal. The careful investigations of Levy,¹ Cannon and Hoskins seem to establish the fact that light chloroform narcosis (as opposed to deep) is peculiarly fatal often when adrenalin is injected; and it is so used just at the beginning of the primary stage, to save the operator a few moments' time. I have so seen it used and result in speedy death. This indefensible desire to save time would appear to be rather common, as it is given especial attention by Jacobs and other anesthetists in their articles. The absorption of many drugs, but preeminently adrenalin, is very rapid when injected, or even applied topically, in the nasal mucosa; in fact, when injected into the turbinates, especially the middle, absorption is more rapid than from any other region. Pilcher has demonstrated this fact in the course of extensive experiments.

The deaths that do occur from chloroform anesthesia, independently of the use of adrenalin, Lévy has shown to be due to cardiac fibrillation, and that adrenalin also can cause this same fibrillation. Again von Anrep and Starling have shown that the rise of blood pressure seen in asphyxia is due to the increased amount of carbon dioxide, which in time increases the secretion of epinephrin. To cap this climax of hazard, Cannon and Hoskins testify that fear and sensory excitation greatly increase the activity of the adrenals. How can any patient escape death who has a submucous resection done under chloroform, in the early stages of which narcosis adrenalin is injected into the septal mucosa? Certainly the operator has placed his patient's life in grave and unnecessary jeopardy.

DEATHS DUE TO ADRENALIN

1. Hubbard reports the case of a colleague in which the adrenalin was injected into the turbinate, under ether-chloroform anesthesia, and death was very speedy. In the light of the preceding facts about anesthesia, it is not surprising, especially as the patient was verging on nervous prostration, which introduced a still worse complication.

2. Under the belief that the death was due to the status lymphaticus, Harris reported a case of removal of the tonsils under cocain-adrenalin infiltration in which the death was almost instantaneous. However, in the discussion that followed the reading of the paper, Harris admitted that perhaps the adrenalin

was actually the cause of the death, despite the finding at autopsy of a thymus weighing 18 gm. In this opinion I concur, as did Swain and Hubbard most vigorously. The right heart was filled with fluid blood till the auricular appendage was five times the size of the left. Thus I am giving the case as one in which the death was due to the adrenalin, of which he received about 8 to 10 minims and of cocain one-twelfth grain.

3. Freudenthal had a patient die after the injection of 10 drops of adrenalin.

4. A reputable rhinologist of this city lost a case on which he was about to operate for deviation of the septum, within three minutes after the injection of adrenalin. The case was that of a young man, who approached the operating room in some distress of mind, and while just barely under the influence of the chloroform the adrenalin was applied. Almost instantly he was observed to be in distress, his breathing shallow; soon the pulse was impossible of detection, then the lungs ceased action. This case has not been published.

DEATHS FROM HEMORRHAGE

1. I saw a patient of a colleague die from hemorrhage of the middle meatus in the extraction of a sarcomatous tumor. He was nearly 55 years of age, and the sarcoma well developed, though it might be possible that asphyxia was the immediate cause of death, as the preliminary tracheotomy and tamponade of the larynx were not done. The blood in great quantities flowed into the lungs, as the hemorrhage was unusually profuse owing to the method of attack employed by the general surgeon who performed that part of the operation. The floor of the nasal cavity was severed from the upper part by a horizontal incision made at the gingivolabial line, giving a free view of the growth, but adding alarmingly to the loss of blood. The case has not been reported.

2. In his paper on nasopharyngeal growths and the complications attending their removal, Sczmurlo reports the loss of one of them through hemorrhage.

3. According to Lémeré, Gerdy had a similar unfortunate experience in removing polypi.

DEATH FROM PACKING NOSE FOR EPISTAXIS

1. Hayen packed a nose with gauze saturated with a solution of perchlorid of iron and saw his patient die some hours later from meningitis. The postmortem showed this inflammatory

process plainly, and also showed the path the infection followed, proving that the olfactory nerve fibers do transmit infection through the cribriform plate to the meninges. The whole length of the olfactory sulcus was stained with a brown discoloration which continued throughout the nerve paths to the meninges.

DEATHS FROM PUNCTURE, OR INJECTION OF AIR OR FLUIDS
INTO ANTRUM OF HIGHMORE

1. Neuenborn reports having seen the death of a colleague's case from irrigation of the antrum, which he thought due to the cocain, but the manner of the death, which was almost instantaneous, excludes this cause.

2. A patient who had had the frontal and maxillary sinuses irrigated before with no signs of distress, at the next visit suddenly collapsed, and soon died when the same procedure was attempted. Such is the report of Henrici, as given in Kelly's paper. The frontal sinus could have had no part in the fatality as it lacks the reflex which the antrum possesses, and which I believe to be the cause of such deaths. Henrici speaks of the death as due to or following an epileptiform seizure, provoked by the shock of the treatment.

3. Hajek's patient was a diabetic who also had arteriosclerosis and was of advanced years. The trocar was introduced beneath the inferior turbinate and the fluid injected for the relief of an empyema. He immediately collapsed, developed a left hemiplegia and soon after died (thirty-six hours) from cerebral apoplexy.

4. Kelly's patient complained of feeling a tickling sensation in his larynx when air was blown through the antrum, and he had an immediate paroxysm of violent coughing, lying prostrate for forty-five minutes. A week later, the air would not go through the ostium and he tried to force it, whereupon the patient's head fell forward and he said the same tickling was present in the larynx and down the arm of that side. He then fell forward unconscious and remained so for three hours, when he complained of pain in the arm and leg and the leg seemed to be convulsively twitching. He died in fourteen hours.

5. In a case showing suppuration of the maxillary, frontal and one sphenoid sinus and polypi, Kelly had already removed the polypi and entered and washed out several times the antrum through the alveolar route. At this treatment he merely inflated the cavity, and was astonished to see the patient's head

fall forward and the patient to become unconscious. A little later a convulsion developed and he died in forty hours.

6. A case which Claus had twice before irrigated, on the third antral irrigation suddenly became cyanotic and died. He incorrectly attributed this to the use of novocain. The autopsy revealed nothing abnormal.

7. His second case died several hours after puncture of the antrum and insufflation of air; again, he wrongly gives cocain as the cause of death. The autopsy showed minute hemorrhagic spots in heart, lungs and brain.

8. One hour after puncture of the antrum, Bowen lost a case, whose death he gives as due to an embolism of the pulmonary artery. This was shown at autopsy to be the immediate cause of it; the passage of the trocar behind the antrum, separating the periosteum from the bone and wounding the vessels there.

9. In Killian's clinic a patient died immediately upon his antrum being irrigated. Killian thought the low temperature of the injected fluid responsible for the death, as it shocked the patient.

10. Culbert punctured a patient's antrum and a septic pemphigus developed soon after. In two weeks the patient died.

The only rational explanation for the sudden deaths that occur in this connection is a reflex irritation of the vagus which can be accomplished by an irritation of the second branch of the trigeminus which supplies the antrum and communicates with the vagus. Killian, Hajek and Félix all agree on this point, and Killian presents the additional fact that in many the irritability of the trigeminus is much greater than usual, and thus the more likely to give the reflex. Moreover, the series of experiments conducted by Kretschmer, Knobloch and Röder seem to prove this method of heart arrest entirely possible.

DEATHS FROM PROBING AND IRRIGATING FRONTAL SINUS

1. Weigest (quoted by Volsen q. v. q.) reports a case of fatal meningitis due to an injury to the dura, made by an attempt to make an application to the frontal sinus. The autopsy showed that the applicator had pierced one of the sinus walls.

2. Mermod was so unfortunate as to attempt to introduce a cannula into the frontal sinus of a hydrorrhea nasalis case, both of whose sinuses at autopsy proved to be absent. The injury to the dura and brain caused in six days a fatal meningitis.

3. Forty-eight hours after the injection of an antiseptic solution in the frontal sinus, Ingals lost a patient from meningitis. He had previously opened the nasofrontal duct intranasally, and had been for a week irrigating the sinus with a mixture of hydrogen peroxid and boric acid solution. On this occasion, as the flow of pus seemed to continue profuse he used more force than usual in an attempt to reach the deep origin. Suddenly the patient complained of pain and became unconscious. Apparently the great atrophy of all the nasal structures which was marked in this case, extended to the walls of the sinus in the deep recess of which, over the orbital plate was a collection of inspissated pus. This under the action of peroxid caused a sudden and violent pressure, with opening into the meninges.

DEATHS FROM REMOVAL OF POLYPI

1. Merckx's patient died four days after the removal of a polyps, from meningitis. He thinks there was a latent meningitis some weeks before operation, as she complained of headache and fever and her disposition had altered markedly.

2. According to L  mer  , Demarquay lost a patient from meningitis after the avulsion of a polypus.

3. Voltolini's patient died from septicemia after a similar operation.

4. Despite his care in doing the operation in several sittings, R  thi lost a patient from meningitis following the removal of several polypi.

5, 6, 7. Heymann mentions three deaths in the hands of reputable rhinologists in Berlin from this operation.

8. Twelve days after operation Tawse lost a patient from brain abscess.

9. Broeckart lost a patient similarly.

DEATHS FROM ETHMOID CURETTEMENT

1, 2. Tawse lost two patients, one seven, the other four days after operation, from meningitis.

3. Five days after a partial curettement of the ethmoid labyrinth, Hajek lost a patient from meningitis. The removal of the middle turbinate, which preceded this operation, had no effect in causing death, in my opinion.

4. Hinsberg lost one patient from simple curettement.

DEATHS FROM TURBINATE OPERATIONS

1. Removal of the inferior turbinates resulted in death in Gregory's case, though the autopsy showed a fractured ethmoid cell, which might have caused the terminal meningitis.

2. Kümmel's patient died from the result of a tear of the dura and a fracture of the cribriform plate, apparently caused by the removal some time before of the middle turbinate. The injuries were not discovered till after death from what was supposed to be an acute frontal sinus abscess. The autopsy revealed the basic trouble and cause of the cranial involvement.

3. The danger of removing the entire middle turbinate in acute frontal sinusitis without first trying the ordinary irrigation is illustrated by the death in the practice of a colleague of this city. The advanced age of the patient made her an especially bad risk, but the ethmoid disease under the middle turbinate soon flared up into an acute inflammatory process, and she died in four days from meningitis. There was an external opening made into the frontal sinus, but the operation on the turbinate caused the trouble.

4. The resection of the anterior end of the middle turbinate caused a meningeal death in Merker's case, as reported by Boenninghaus.

5, 6. The classic cases of Quinlan and Wagner, each of whom lost a patient from galvanocauterization of the middle turbinate, are well known.

7, 8. Réthi, however, adds to the records a case of Lange and another of Lublinski, dead from the same cause, meningitis following galvanocauterization of the middle turbinate.

9. My own case, unpublished thus far, was particularly unfortunate, as it was an operation of choice and one in which so little was done that the death was as shocking to me as to the family of the patient. Under ether, because of his extreme nervousness, the right inferior turbinate was resected, only to the extent of the inferior edge, about one-third of the bone being removed anteroposteriorly. In addition, with forceps the remains of adenoid tissue were removed, a small centrally located, fibrous mass as large as the tip of the little finger. He took the ether very badly, and never regained consciousness after its administration, passing into violent convulsions the next morning and later lapsing into coma, dying the third day from cerebrospinal meningitis. A few moments after death, a thin stream of cerebrospinal fluid trickled down the upper lip, having escaped

from the cribriform plate on the operated side. That the patient should never have come out of the ether, but passed insensibly into the unconsciousness of meningeal infection, and that this infection should have followed so insignificant an operation as indicated, strongly suggests that the patient already had a latent meningitis at operation.

DEATH FROM EXPLORATION OF THE SPHENOID SINUS

1. Emerson's attempt to curette the sphenoid sinus ended in death, because his instrument injured a vein which communicated with the cavernous sinus. A dehiscence in the lateral wall of the sinus exposed the vein to this unexpected injury.

DEATHS FROM RESECTION OF THE NASAL SEPTUM

1. Eight days after operation Hays' patient died from meningitis.

2. Alexander also lost one in a similar way.

3, 4. Miodowski's first patient died in four days after operation; the second developed erysipelas on the fourth day, and died from meningitis on the sixteenth day. In the latter case, infection was traced through the olfactory tract.

5, 6, 7. A reputable rhinologist of this city lost three patients from meningitis through no fault of technic or after-treatment; nor was there any pus in the nose at operation. These cases have not been reported.

8. However, there was frank pus in the nose of this case, as it was due to a chronic suppurative ethmoiditis, and the death from meningitis which followed in five days was neither surprising nor to the credit of the operator, a man of reputation in this city. It need hardly be stated that the case has not been reported.

9. A colleague in this city quite recently lost a patient from cerebrospinal meningitis in a week after operation. A decompression operation was done, which seemed to relieve the symptoms for a day. The infection was through the cribriform plate. The case has not been reported.

I wish to make especial acknowledgment of my debt to Dr. Eugene Félix, whose thorough paper and comprehensive bibliography have been of the greatest value. I have followed both rather closely, and have, I hope, been able to add somewhat to the number of cases and of observers.

That the interior of the nose is both theoretically and practically a zone of considerable danger for even the slightest

instrumental interference I hope I have shown, and that the indiscriminate use of adrenalin is similarly fraught with danger in this region, when used for operative assistance, can be no longer ignored.

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DISCUSSION

DR. J. M. INGERSOLL, Cleveland:—I hardly feel competent to open this discussion or to say much about Dr. Dabney's valuable paper. I think any paper that calls our attention to the dangers which follow intranasal operations is a timely paper. We are inclined, I think, to accept as a fact the statement that the nose has a peculiar ability to take care of itself and to resist infections in operative procedures. Clinical experience seems to bear this out, else we would have many more fatal infections or deaths from intranasal operations. Anything that calls our attention to the danger of infection helps to make us more careful. Personally I have been fortunate enough not to have any deaths from instrumentation alone. Dr. Dabney speaks of some cases which apparently were due to instrumentation alone, not to infection following the operation. In his own case which he cites there is a question in my mind whether the death was due to the nasal operation or whether it was due to some other cause, possibly the anesthetic. I could not hear all that he said and perhaps I did not understand his statements exactly. The impression I got was that the patient did not recover from the anesthetic, and the question in my mind was whether the anesthetic or the nasal operation was the cause of death.

I have had two cases of brain infection die. I like to think that the brain infection took place before the operation, and the history helps to make me think that way. One of them was a man, who had been shot fifteen years before. The bullet entered just above the inner canthus of the eye, went through the ethmoidal region and back into the anterior part of the sphenoidal cavity. An attempt had been made at the time to remove it but unsuccessfully. The wound healed and for fifteen years he had been comfortable. Three weeks before I saw him he had some symptoms of brain irritation and the physician who brought him was suspicious that he had a developing meningitis. When he came to the

hospital he had a temperature of 103 and showed symptoms of brain irritation. We radiographed him and located the bullet in the sphenoidal sinus. It was very firmly fixed, and I decided that a Killian operation would be the best method for removing the bullet. When I had located the bullet I used reasonable force in attempting to remove it, but was unable to do so. Several days later the second attempt to remove the bullet was made. I was afraid to use very much force, because I feared that an avenue of brain infection might be opened up. The symptoms of meningeal irritation were increasing, and he died a week later of meningitis. I felt quite sure he had a meningitis when I first saw him, and I do not know whether or not he would have recovered if I had succeeded in removing the bullet.

The second case was one of acute frontal sinusitis. He was brought into the hospital one day at 1 o'clock with a temperature of 105, and with evident symptoms of meningitis. His condition was so bad that I operated at once without having a Roentgen ray taken, a thing which I rarely do. The frontal sinusitis was evident—pain, swelling, redness and some exophthalmos. There was a large frontal sinus filled with rather thick pus; careful examination did not show any area of necrosis between the sinus and the brain. The following day he was no better, and I then decided to open the ethmoidal labyrinth through the nose, and found pus in the ethmoidal cells also. In spite of the free drainage through the frontal and ethmoidal cells symptoms of meningitis increased and he died two days later. No autopsy was permitted. I am sure that he had a meningitis before he came to the hospital and that his death was not due to any accident in the operation.

DR. H. H. MARTIN, Savannah, Ga.:—Just a word in this connection as to anesthesia. I am in favor of injecting the gasserian ganglion with novocain as an anesthetic for many operations about the head and face. I first became interested in this work through Sluder's injection of Meckel's ganglion and injections of the gasserian for tic douloureux. Dr. Dabney's theory that irritation of the vagus through the second branch of the gasserian ganglion might be the cause of death in some of these cases, is my excuse for discussing this phase of the question. I find in experimental work that absolute anesthesia of all branches of the gasserian ganglion can be obtained by injecting a few minims of a 2 per cent. solution of novocain. This, in my opinion, eliminates any danger from the use of an anesthetic locally and in addition eliminates irritation of the vagus as a possible cause of death.

DR. GEORGE S. SPOHN, Elkhart, Ind.:—I wish to ask a few questions of the essayist with reference to the use of adrenalin. It seems to me it is not just to say those deaths were due to adrenalin, especially after giving chloroform. How do we know they were not due to chloroform? We are certain that adrenalin increases the blood pressure. If the blood pressure had been taken before operating the deaths might have been avoided. I would be inclined to think the deaths were due to chloroform rather than to adrenalin. If there is any irritation or any weakened condition of the vagus and a soothing effect is desired, why cannot the surgeon resort to the same means that are practiced by general surgeons—give a dose of hyoscin or atropin to quiet the vagus? Our abdominal surgeons are doing this and the rhinologists can do the same. I am glad to hear this paper. I wish it could be published in every medical journal in America, especially for the general men, who would greatly profit thereby.

DR. OLIVER TYDINGS, Chicago:—I have not had any experience in the way of fatalities in nose and throat work. I am fully in harmony with

what Dr. Spohn has said, that he would not attribute all these deaths to adrenalin. I have not removed a tonsil since 1904 or operated on the nose in my life without using adrenalin. I do not inject it into the tonsil, but around it. I do use it in the nose, but do not inject. My time may come after a while because there is a law of coincidences.

I read some time ago where two young girls walking across an open field met two men. One of these girls dropped dead. It was most fortunate that it did not happen in a hospital in the course of preparation for an operation. I was told of a case of fatality supposed to be due to adrenalin, by the late Dr. Kinsman of Columbus, after an injection of two syringes of adrenalin chlorid (size of syringe not stated). I had used it up to that time quite freely, but later found that much smaller doses would control bleeding. I have never seen any serious disturbance due to adrenalin, and I shall continue to use it, but I should hate to be condemned because some case should die from some unknown cause. I do not know that there is any similarity of action between its use in a dog and a man, but I injected an ounce into a dog weighing 15 pounds and there was no harm done. I should like to look deeper into the cause of death in these cases.

DR. S. J. KOPETZKY, New York:—Just a word in contribution to the controversy which has arisen as to the cause of death, that is, adrenalin or chloroform. I think the point at issue might be settled by reference to the English report on anesthetics, published some years ago, that it is due to the combination. Chloroform and adrenalin together will in selective cases produce death. I, too, have had my experience along that line which made me feel the truth of the reports in that connection. They report that the use of adrenalin and chloroform should not go together. Nor is it necessary.

DR. D. ISAACS, Omaha, Neb.:—In regard to the use of adrenalin, which is a protein, I have used it considerably in combination with cocain in shrinking the turbinates. After allowing sufficient time for the patient to become sensitized following its use, anaphylactic reaction is very apt to follow its subsequent use. The reaction is manifested by sneezing and rhinorrhea with considerable discomfort. I have never seen alarming symptoms follow its use. In one case following its application to one side of the nose, the corresponding side of the face became edematous and the eye was almost swollen shut. This was the most pronounced reaction from its use that I have seen. Lately I have used cocain alone without any reaction at all.

DR. G. M. CASE, Elmira, N. Y.:—Most operations for sinusitis are done in the office, and with very little preparatory treatment. The patient has pain and it is so easy to cocainize the nose and open the ethmoid or maxillary sinus we ignore, or rather neglect, to go into details regarding previous history. Hence in those cases that bad results follow an operation it would seem the infection must have been deeper than a casual examination could determine. I have been unfortunate in having two cases, something like the reader of paper described. I used cocain and adrenalin anesthesia, and operated on patients for acute ethmoidal disease, by removing a portion of middle turbinate and curetting ethmoid cells. Within twenty-four hours both patients became drowsy and gradually passed into a comatose state and died later in deep coma. I cannot, for a minute, think the adrenalin had anything to do with the fatal results. The infection, it seems, must have been deeper than was realized at time of operation.

DR. MYRON METZENBAUM, Cleveland:—A series of research work shows conclusively, at least in dogs and rabbits, that the organic adrenalin is

capable of killing animals in certain doses. It also showed that organic adrenalin that had become aged somewhat was considerably more toxic than the synthetic adrenalin, which is more stable. Most pharmaceutical houses put out a tablet with either organic or inorganic adrenalin, thereby preventing one from adding a toxic dose of adrenalin. The Eberfeldt firm put out a novocain with synthetic adrenalin known as D. E. & T. tablets, each containing the same quantity of novocain but each with a lesser quantity of synthetic adrenalin. This tablet can be boiled, and it has been shown that it does not decompose even if the tablets are as much as 2 years old.

DR. MERCER, Detroit:—In some blood-pressure experiments it has been found that adrenalin injected subcutaneously has no general effect; injected into a muscle it has a rather slow prolonged, general effect; injected into a vein its action is marked and rapid. This in all probability has some bearing, as there would be rapid absorption from the rich venous tissue of the turbinals.

DR. P. J. H. FARRELL, Chicago:—I had in mind practically the remarks of the last speaker. We know that with even a small blood vessel injected you get a marked effect from the use of adrenalin. Another thing, a light narcosis is a dangerous narcosis. That is where you get that unknown and unlooked-for element called shock which is often fatal. In these light narcoses there is greater danger than where you have a full anesthesia in short operations of this class.

DR. JOSEPH BECK, Chicago:—I would like to make a few remarks. In the first place I would call attention to the gentlemen who have discussed this paper that when they get their discussions back they go over them very carefully, because these discussions are read by prominent attorneys all over the country, and you might be called upon to refute your remarks as to some of the dangers. Dr. Spohn has hopes of this paper being published in every medical journal in the country. I hope it will, after the remarks and the paper have been gone over. I speak from personal experience in this regard as a witness for medical men. In regard to adrenalin, I have been very much interested, and I have gone to two people that I thought should know. One is the commercial and the other is the scientific man. I wanted to establish the fact as to the toxicity of adrenalin. I have been using it subcutaneously for three years in otosclerosis without any bad effect. Dr. Crile has written a book in which you will see a good deal of work on the subject of adrenalin, and it will be worth your while to watch for that book and read it. Fetterhoff speaks of the effect of adrenalin on the vagus, and adds that he has injected salt solution into the region of the anterior septal cartilage with sudden collapse of the patient, so that it is not always the adrenalin that we have to do with. I am not in sympathy with the report that adrenalin causes these deaths. But it is the ischemic effect it has on the nasal nerve and its proximity to the vagus. As to deaths from operative interference, I think any man who has a large experience, especially in public hospitals, is bound to have such cases, and I think we all have them, but we cannot report all. We suffer from these discussions in cases of accidents in which we are not to blame.

DR. VIRGINIUS DABNEY (closing discussion):—Dr. Kopetsky reiterated what I thought I had made clear. I said if used in connection with light chloroform narcosis adrenalin is dangerous. It has been established by autopsies that there was an auricular fibrillation, which is not a coincidence at all. In one case the right auricular appendage was five times the size of the other. Adrenalin is a valuable drug, but as soon as you get it into your mind that such a drug is not dangerous you are on

dangerous ground. As to reporting these cases, I think you may get into trouble, as Dr. Beck suggests, but as to deaths from instrumentation, I think they should be reported for the simple reason that men who live away from educational institutions, large hospitals and clinics are apt to read about these procedures, like the submucous operation, and think they are perfectly simple. Of course, a man who probes a frontal sinus that does not exist has himself to thank for the procedure. If you publish *that* you will make people know that a radiograph is a good thing to have. A great many of these cases were not due to any infective process so far as could be seen. Of course any one who does a submucous on a patient with a suppurative ethmoiditis is going to have a death. I make a plea for reporting deaths from mere instrumentation alone. I think we all ought to do that.

SOME REMARKS ON THE SUBJECT OF POLLEN THERAPY IN POLLINOSIS

WITH RESULTS OF TREATMENT BY IMMUNIZATION METHODS
DURING 1915

SEYMOUR OPPENHEIMER, M.D.

AND

MARK J. GOTTLIEB, M.D.

NEW YORK CITY

The term "hay fever," although it has received almost universal adoption, is a misnomer, covering as it does all the forms of periodical influenza. We use it only in its most generic sense. Our preference would be pollinosis or pollen disease. Although not dangerous to life, it causes at certain times such extreme discomfort to some of its victims as to unfit them for their ordinary pursuits. While it is possibly among the minor ills that the flesh is heir to, a prominent place must be assigned to this curious infirmity. If we accept the view that it is a disease of the classes rather than the masses we may take the viewpoint of self-congratulation rather than of humiliation as indicating a superiority in culture and civilization of the favored few. When this idea of the intimate connection of pollinosis and culture has been firmly grasped by the public mind, the complaint will perhaps come to be looked upon like gout, as a sign of breeding. It will be assumed by those who have it not like Louis the Fourteenth's courtiers who submitted their sound flesh to the surgeon's knife in pious imitation of their majestic but diseased master. Soon, no doubt, presence or absence of the tendency to sneeze at the sight of a rose will become a test surer than the letter "h" for the separation of the elect from the common herd.

To speak more seriously, however, the prospect opened up by modern observation is rather alarming.

As civilization and culture advance, other diseases analogous to the one under consideration may be developed from oversensitiveness to sound, color or form, and the man of the twenty-first or twenty-second century may be a being of pure intellect, whose organization of mere nervous pulp would be shattered by a strong emotion, like a pumpkin filled with dynamite. Per-

haps, however, in that dreary time of omniscience to which we are all said to be hastening, when machinery shall have taken the place of Nature, and nothing is left to remind the world of flowers but dried specimens in botanical museums, the disease will become extinct equally with the cause. At the present time we are fortunately still far removed from this consummation and the human is warmly interested in devising means of curing the disease.

Hay fever, or pollinosis, is a disease which manifests itself in the spring, from the early part of May or June to early or middle July, and in the autumn from the middle of August to the end of September or early October. It is characterized by itching of the eyes and lachrymation, sneezing, seromucous discharge from the nose, obstructed breathing and itching of the palate and face. If the attack is very severe, sooner or later there is coughing and difficult breathing accompanied by wheezing. Pollinosis is caused by the action of the pollen grains from flowering plants, the pollen being carried by air currents and thus conveyed to the mucous membranes of the eyes, nose and the remainder of the respiratory system. If the recipient is susceptible to any of the pollens which occur in the air and if their concentration is sufficient to go beyond the threshold of reaction, an attack of pollen disease will promptly ensue.

The term rose fever as applied to the spring variety of pollen disease is also a misnomer, because of a large series of cases of vernal pollen disease tested by us we have only found one case which was sensitive to the pollen of roses. To be correct, one should speak then of the spring type and fall type of pollinosis. The impression of the patient as to the causative pollens cannot in most instances be depended upon. In many instances patients have made the suggestion of the most unique pollens as being responsible for their attacks, but upon investigation this was proven to be a faulty observation in the large majority of cases.

ETIOLOGY

Predisposing Causes.—Heredity plays a very important rôle in the etiology of pollen disease, as we have shown that over 90 per cent. of our cases have other members of their family who suffer with allied ailments, such as urticaria, asthma or other manifestations of anaphylaxis, following the ingestion of casein, egg white, shell fish, or are sensitive to the contents of pollen, flies, or are anaphylactic to the dust, and serum of horses and cats.

Any denuded surface on the body is a suitable place for the parenteral absorption of the proteins of pollen, so that given a patient whose antecedents either in collateral or direct line have shown themselves to be sensitive to any of the above-mentioned substances, that patient, if so exposed, will in all likelihood develop pollen anaphylaxis. For the above reason, it can be easily understood why chronic inflammatory conditions of the nose and throat, such as sinusitis or obstructions to drainage, make these organs a suitable place for the reception of this disease. The nasal factor, however, should not be considered as too important; in fact, many of the patients under our care have had considerable surgical treatment of the nose at previous times in the hope of the relief of the condition, and it has been but in the rarest instance that benefit has resulted. While it is important that a marked stenosis of mechanical condition causing definite pressure of a suppurative process in the accessory nasal cavities should be corrected, yet to attack every slight septal irregularity or other deviation from the normal by surgical means is in our judgment a procedure which should not be countenanced.

Exciting Cause.—The cause of this disease has definitely and conclusively been proved to be the pollen of anemophilous plants, particularly the graminaceae, cyperaceae and compositae.

In a previous communication we have enumerated a large variety of pollens which we have found active and which our botanists have been engaged in the collection of.

The collection work is most important, and considerable experience has been gained as to the best means of conducting this work. Some grasses and plants were found to be best brushed in the fields, whereas others have to be subjected to a variety of other methods to obtain the best results.

In order to carry out this work in the most satisfactory way it is desirable to have as large a working collection of pollens as possible, so as to be able to treat patients coming from distant points with the particular pollen of the grass or plants which grows abundantly in the locality in which the individual patient lives and is exposed to and to which he is susceptible.

The method of preparation of the pollen extract we have dealt with in a previous report. At the present time our laboratory staff is engaged in a large series of experiments for determining what relation exists between different methods of pollen extraction and their solution or suspension and the degree of immunity induced.

It is possible to produce a typical attack of pollen disease in a sensitive individual at any time of the year independent of the time when the plants bloom to which the patient is sensitive. A small quantity of pollen, if aspirated into the nose, will cause a typical attack of pollinosis which will last for a few hours, and if the quantity sniffed up is very large, a severe attack of anaphylaxis may result.

Diagnosis.—Three methods may be employed for determining which pollen a patient is anaphylactic to. The ocular, the hypodermic or the cutaneous method. The method which we now use for determining which pollens are operative in a given case is the skin scarification or cutaneous method. A very small scratch, not enough to produce bleeding but sufficient to cause the exudation of serum, is made on the arm of the individual to be tested, and a very minute quantity of pure pollen is gently rubbed into this wound. In a very few minutes a wheal will develop around this area of scarification. The swelling and redness are measured after fifteen minutes has elapsed; subsequently such vaccinations are made during the course of treatment, and are again measured after a fifteen-minute period, so as to determine whether the size of the wheal diminishes as treatment and immunization progresses.

Some patients are susceptible to only one or two pollens and there are other patients who suffer from a sensitiveness to all pollens, so that the latter have symptoms of pollinosis lasting five months during the spring and summer, while the former exhibit symptoms but from six weeks to two months. It is important to bear in mind that a patient showing symptoms, let us say, by way of example, from May 15 to July 15, that their symptoms are not due to a single pollen, but rather the attack is kept up by a succession of different pollenizing periods of the different plants which are operative in the given case. It is important for this reason to learn from the botanist working in the fields when each grass begins and terminates its pollenization so as to determine the period of the beginning and the ending of the proposed immunization to the individual pollen. The earliest we have found the patient suffering from pollen disease in this locality is about the first of May. This spring, however, we had a case under our care whose attack of pollinosis began in the early part of April. He is a resident of Southern Georgia and is sensitive to the pollen of the pecan tree. The latest we have known patients to suffer from pollen anaphylaxis is the

latter part of October. This occurred in several cases suffering from the fall variety of pollen disease who sojourned to an immune locality during August and September, and on returning in October, developed symptoms of pollen anaphylaxis because they had not developed their usual seasonal immunization and are just as sensitive in October as they were in the early part of August.

In conjunction with the scarification method of diagnosing which pollen is operative we have made extensive use this year of the complement-fixation test of the patient's blood, using an antigen of the pollen which gives the most intense reaction. In that way we are able to gauge how much natural immunity exists. After ten or twelve treatments, the complement-fixation test is again performed to determine the amount of immunity produced. In this way we are able to judge when treatment should be stopped. It has been our experience that pollinosis patients who have never had treatment show a doubtful fixation test, whereas those who have had treatment the previous year show a reaction of between three and four plus. From this it can be deduced that a patient having had treatment the year previous carries over a certain degree of immunity to the ensuing year. This is important in its practical bearing on the duration of seasonal treatment required.

Complications.—Notwithstanding the fact that the subject of pollinosis has never been taken with sufficient seriousness by the profession and general public, it nevertheless has its serious aspects. A case of pollinosis may develop a train of symptoms which, if remaining untreated, may be the cause of an untimely death.

One of the most common complications is asthma. Patients suffering with pollinosis, especially those who breathe through the mouth, due to obstructed nasal passages, inhale into their bronchial tubes large quantities of pollen which cause a swelling of the mucous membrane of the lower respiratory tract, with the production of typical asthma. Superimposed upon this, should the patient be unfortunate enough to have his bronchial mucous membrane infected by any of the micro-organisms which are natural inhabitants of the respiratory tract, such as streptococci, pneumococci, etc., asthmatic symptoms are perpetuated throughout the year with an accompanying profuse bronchorrhea. The asthma and bronchitis are very much worse during the time the patient is exposed to the pollen disease, and the conditions are as pitiful as any that the physician has to contend with. Ultimately

the pulmonary tissue becomes dilated and emphysema, followed by the usual cardiac dilation, may ensue.

Nasal sinusitis occurs very often during an attack of pollinosis, due to retention of secretions from obstructed drainage of the sinuses and deafness due to tubal catarrh or pressure upon the membrana tympani during violent paroxysms of sneezing is a very common complication and sequel of this disease.

Prognosis.—A great many cases of pollen disease have their attacks each year without acquiring any of the complications or sequelae referred to. In fact, we have seen patients who have suffered with this illness for over forty years and, with the advent of age, the intensity of their attacks have gradually diminished so that they are moderately comfortable during the season for pollen anaphylaxis. On the other hand, we have seen severe pollinosis accompanied by asthma and bronchitis followed by chronic emphysema and myocarditis. It is our firm conviction that every case of pollen disease, either complicated or uncomplicated, except where degenerative changes have taken place in the pulmonary or cardiac tissue, can be benefited if not cured if we are in possession of the pollens which are instrumental in the causing of symptoms in the given case. The cases which have superimposed on the primary condition and infective bronchitis do often very well, if an autogenous vaccine from the pathogenic micro-organism found in the sputum is administered in conjunction with the specific pollen antigen. The outlook depends in a great measure upon the general condition of the patient. Many patients come to us very much below weight, with an anemia or other physical incapacity, which if not corrected by proper medication or diet, or other measures, the treatment will be a failure because they are unable to produce for themselves an immunity.

Treatment.—We have referred in our previous writings to the principles underlying the basis of all immunization methods, and these same methods which have proved so successful in bacterial conditions, it is our belief, can be applied to a nonbacterial factor.

We recognize two different immunization methods, active and passive. By active immunization we mean an immunity which is developed in the individual himself, and passive immunization an immunity which is transferred from an animal to a human being or from one human being to another.

Active Immunization.—It is our practice to begin treatment about eight or ten weeks before the expected onset of symptoms. Gradually increasing doses of pollen extract are given about every

four to six days; should an immoderate swelling and itching occur at the site of the injection, the dose is lowered or remains the same until no more reaction occurs to that dose, and then we proceed increasing the dose as before. If a patient is susceptible to more than one pollen, an individual injection of each is given so as to gauge the dose of each pollen and thus vary it according to the reaction produced by the previous injection. Under these circumstances we have been compelled to give to some of our patients five or six hypodermic injections at each treatment. These directions as to treatment are, of course, subject to much modification in each case and can only be construed in the most general way. Much judgment must be employed in employing an accurate dosage as it is all important in its bearing on the results. Our observation has been that an excessive dosage will break down the potential resistance of the patient and defeat the object which we strive to obtain.

Passive Immunization.—Should any of our patients not be able to develop for themselves enough immune body, as would be expected from the effect of the injections of pollen extract, one large dose of blood serum is administered from a rabbit that has had large quantities of pollen extract injected at regular intervals for about five months. Under these circumstances the rabbit serum shows an antitoxic content of thousands of units which are sufficient to bind the antigen with the complement in the blood and thus effect a quick proteolysis of the antigen down to amino acids and ammonia, which are not toxic. Only one dose of this serum is given and thus the possibilities of anaphylaxis occurring are avoided.

Many of the patients who have come to us during the attack of pollen disease have felt greatly improved within a number of hours after the first treatment. About all of the patients in this group stated that their symptoms were decidedly modified by each treatment. It has been observed, if treatment is kept up regularly at the proper intervals, the symptoms disappear entirely. Should the patient's vitality be insufficient to build up for himself an immunity, we administer a large dose of immune serum, as stated before, and our results for this procedure have been most satisfactory.

RESULTS

Spring Cases.—From our published reports in 1913-1914 we had the gratification of having 50 per cent. of seasonal cures. After much refinement in our method of pollen collection, extraction and suspension, etc., and the experience gathered from our

previous year's work, we are able to state that of the thirty-two cases of spring pollinosis (1915) which we had under our care, only two have shown symptoms. Some few patients exhibited symptoms of but a few moments' duration and of the mildest intensity, and can be construed as having been satisfactorily immunized. In one case we have not been able to determine the pollen to which he reacted markedly, and treatment with the pollens to which he was but mildly anaphylactic has been conducted very irregularly.

Fall Cases (1915).—Eighty-five cases were subjected to diagnostic tests, the detailed report of which in connection with the report of the thirty-two spring cases tested, will be taken up in a subsequent communication.

Of these eighty-five cases, sixty-two took up treatment. These latter cases can be divided into two groups, the one comprising fifty-two cases who began their treatment sufficiently in advance of their attacks to have made the immunization possible. The other group comprises those cases who either consulted us during their attacks or but very shortly in advance of the expected attacks. Of the first group of fifty-two, fifteen were definitely free from symptoms, twenty-five were markedly improved (this being the direct expression of opinion of the patient) and twelve had their symptoms apparently in no way modified by the treatment, although it appeared that the attack took place rather later than in previous years.

Of the second group of ten, in four the attack was decidedly beneficially influenced after but one or two injections.

CONCLUSION

The authors feel it incumbent on them to warn the medical profession against "hay-fever" vaccines as exploited by the various pharmaceutical concerns. Our attention has been called recently to a vaccine that has been put on the market, which contains a mixture of a large number of pollen extracts. This mixture is given both for spring and fall cases. No diagnostic means are employed to determine which pollens or pollen are operative in a given case. Under these conditions many a patient who is suffering from the spring variety of pollinosis, being already a fit subject for further sensitization, is placed in danger of becoming sensitized to those pollens which are active during the fall. It may also be stated that pollen extracts in large doses are extremely dangerous and with the dosage not properly controlled by experienced workers in this particular field, a calamity

from mishandling may cast a shadow upon a very valuable proposition.

We speak in emphatic terms upon this subject because in our experience we have seen the ill effects of large doses of these substances and appreciate their dangers; therefore this note of warning.

Let us but express the hope that you have not alone been interested in the subject we have presented to you, but that you have been impressed with the honesty and earnestness of the manner with which this work has been conducted, and it is our hope that at least a fair proportion of those patients who are under our care will have their symptoms so improved that they will no longer have occasion to fear the gracious odors conveyed upon the gentle wing of some calm breathing wind.

INTUBATION OF THE ESOPHAGUS FOR CICATRICIAL STENOSIS

WITH REPORT OF A CASE DUE TO SCARLATINA

SAMUEL IGLAUER, M.D.

CINCINNATI

The introduction of permanent tubes into the esophagus was first practiced for the relief of the dysphagia of carcinoma of the esophagus. As early as 1881 Krishaber¹ described his method of introducing permanent tubes through the nose into the pharynx and esophagus. The patients were nourished through these tubes.

Soon after Berry² employed railway catheters "introduced and withdrawn by sliding them over a catgut bougie previously introduced."

Symonds³ devised shorter funnel-shaped elastic tubes which were introduced into the esophagus on a whalebone guide and which could subsequently be withdrawn by means of a silk string attached to the proximal end of the tube.

Renvers⁴ substituted hard rubber tubes for the Symonds tubes, and one of his patients wore such a tube continuously for seven months.

In the treatment of cicatricial stenosis the methods employed have been somewhat modified, as in this condition the object is not only to relieve the dysphagia, but also to effect a permanent cure.

Von Hacker⁵ treated cicatricial cases by his ingenious method of stretching a drainage tube over a rigid rod, which was withdrawn after the stretched tube was in place. He thus obtained elastic pressure upon the narrowed walls of the esophagus.

Ebstein⁶ employed the same method but introduced the tubes through the esophagoscope.

Jackson⁷ devised permanent esophageal tubes, which were pushed over a stylet previously introduced.

Excellent results are reported by Guisez,⁸ who employs short rubber tubes of the shape of a hollow collar button. This is

1. Krishaber: Tr. Internat. Med. Cong., 1881, ii.

2. Berry, J.: St. Bartholomew's Hosp. Rep., 1884, xx.

3. Symonds: Brit. Med. Jour., April 23, 1887; Lancet, March 30, 1889, i.

4. Renvers: Ztschr. f. Klin. Med., xiii, Hft. vi.

5. v. Hacker: Handbuch d. Prac. Chirurg., 1899 ii, 463.

6. Ebstein: Ref. v. Hacker, op. cit.

7. Jackson: Tr. Am. Laryngol. Assn., 1909.

8. Guisez: Arch. Int. de Laryngol. d'Otol. et de Rhinol., xxxv, March-April, 1913.

stretched on the end of a sound and introduced each time through the esophagoscope. It may be withdrawn by a string attached to the proximal end.

Sargnon⁹ introduces a slender drainage tube doubled back over at its middle and placed in position while stretched on a metal guide.

Jacques¹⁰ recommends small permanent bougies or catheters introduced through the esophagoscope and anchored to a molar tooth.

Brünings¹¹ employs cylindrical bougies, or urethral bougies introduced on a straight wire carrier having an adjustable shoulder to prevent the wire from protruding through the tip of the bougie.

The method which I employed in the case about to be described was as follows:

1. The patient was induced to swallow several (5 or 6) yards of silk thread, or guide string (button-hole twist) according to the method of Mixer.¹² As soon as the distal portion of the thread had passed into the intestines tension could be made on the proximal end without its being withdrawn.

2. An ordinary small soft rubber catheter, about 6 inches long, was perforated at the tip (with a hot wire) and also near the proximal end. The sharp edges on the catheter were then singed off.

3. A stout silk thread was tied in the proximal perforation, while the catheter itself was slid over the swallowed guide string.

4. The distal portion of a long whalebone bougie was introduced into the catheter and a narrow piece of adhesive plaster was wrapped around the whalebone to act as a shoulder and prevent the whalebone from protruding through the tip of the catheter.

5. With the guide string held taut and leading the way the lubricated catheter was then introduced until its distal portion had entered the stomach, when the whalebone was withdrawn.

Finally, the strings protruding from the mouth were encased in fine rubber tubing to prevent their being chewed, and were fastened to the cheek with adhesive plaster. It is often prefer-

9. Sargnon: Ref. Guisez Op. cit.: Arch. Int. de Laryn. d'Otol et de Rhinol, March and April, 1913, xxxv.

10. Jacques: Annales des Malades de L'Oreille et des Larynx, 1912, No. 12, xxxiii.

11. Brünings, W.: Die direkte Laryngoskopie et a Wiesbaden, 1910; also Ztschr. f. Ohrenh. u. f. d., Luftwege, 1910, lxii Hft. 2-3, p. 195.

12. Mixer, S. J.: Tr. Am. Laryngol. Assn., 1909.

able to bring the strings out of the nose with a Belloque cannula (Fig. 1).

The catheter was allowed to remain for a week or more and was subsequently replaced by larger and larger catheters until the stricture was well dilated.

The following case illustrates the use of this procedure, and is also very interesting from the standpoint of the etiology of the esophageal stenosis.

Ollie G., aged $5\frac{1}{2}$ years, was referred to me by Dr. G. R. Roessly, Nov. 9, 1914. The chief complaint was of regurgitation of food.

At 3 years of age the child had measles. At the age of 4 he had a severe attack of scarlet fever, accompanied by marked throat symptoms. During the latter part of this illness he began to have trouble in swallowing and fluids regurgitated through the nose.

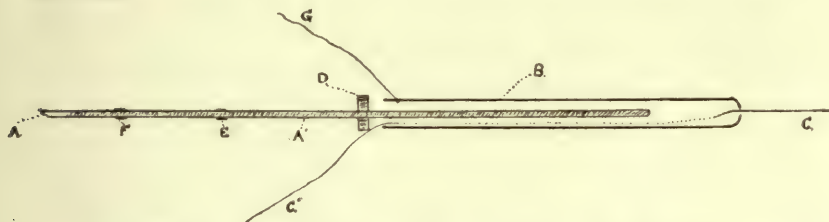


Fig. 1.—Showing arrangement of catheter, introducer and guide string. *A-A'*, introducer; *B*, catheter; *C-C'*, guide-string; *D*, shoulder; *E*, distance to the stricture; *F*, distance through the stricture; *G*, withdrawal string.

Following scarlet fever, "as fast as he would eat he would spit up the food." He could take no solids. Regurgitation at frequent intervals has continued ever since.

About one year ago his weight became reduced to 27 pounds, at which time he received rectal feeding.

Present Condition.—At the present time (November, 1914) he lives chiefly on milk and rice, with occasional solids very finely divided. Food often returns while he is at the table and at other times several days after its ingestion. At present he weighs 49 pounds, and is fairly well developed.

Physical Examination.—The anterior pillars of the fauces on both sides have a button-hole perforation with cicatrized edges. The tonsils are visible through these perforations, the result of ulceration during scarlet fever.

A roentgenogram, by Dr. Lange, shows the swallowed bismuth mass arrested by a stricture about 2 inches above the diaphragm. The esophagus above is somewhat dilated.

On esophagoscopy, $9\frac{1}{2}$ inches from the incisor teeth, a web-like scar with a small slit-like opening about one fourth inch long was encountered. After considerable difficulty a fine steel blunt-pointed wire was passed through the stricture and over

this Sippe's smallest olive was guided. Then a small-sized olive on a whalebone bougie was introduced.

For a few days after the esophagoscopy small olive-tipped bougies were passed by touch, but with increasing difficulty. Therefore several days after the esophagoscopy, the child was induced to swallow a silk string as described above. Over this the smallest Plummer¹³ olives passed with ease.

Continuous dilatation with a catheter was then begun. A No. 10-E catheter was passed over the string and allowed to remain for thirty-six hours. The child was fed through the tube which protruded from the mouth.

Peroral tubage was continued, with interruptions, in this manner for twelve days. Then a catheter (6 inches long) prepared as described above was introduced with the anchor string protruding from the mouth (Fig. 2). This treatment was continued for about two weeks, at which time the tube could not be removed by traction on the anchor string. Esophagoscopy showed that the tube had passed beyond the stricture and the esophagoscope could not be passed through the stricture.

On the following day, Sippe's¹⁴ hollow, spiral-wire sound, with a terminal olive, was slid over the string and through the stricture, dilating the latter and permitting the catheter to be withdrawn.

Shortly afterward intubation was renewed for one month until one fine day the patient chewed through the anchor string. Roentgen-ray examination showed that the tube had passed into the stomach and ten days later it passed per rectum.

During this latter period, treatment was discontinued and the stricture narrowed so much that it would only admit a No. 8-E catheter. Intubation over a string was then continued, with larger and larger catheters (No. 10 to 12-E) for about three weeks, at which time bouginage with small Plummer olives was begun, at first with a guide string and finally without a guide until the present time, when the largest olive (No. 16-E) passes freely.

The treatment is now carried on by the child's father. The patient eats everything that comes to the table, avoiding large pieces of food. He weighs 57 pounds and has improved in every way.

(NOTE.—A Wassermann test of this patient, made shortly after the reading of this paper, was reported negative by Dr. A. Faller.)

COMMENT

Intubation of the esophagus should usually be preceded by an esophagoscopic examination. In exceptional cases where the diagnosis seems well established by the history and Roentgen-ray

13. Plummer: *Jour. Am. Med. Assn.*, Feb. 23, 1911.

14. Sippe: See V. Mueller Catalogue.

examination, intubation by the guide-spring method may be undertaken without esophagoscopy. At any rate, the method offers the advantage that repeated introduction of the esophagoscope is not required, as is the case with most modern methods of intubation.

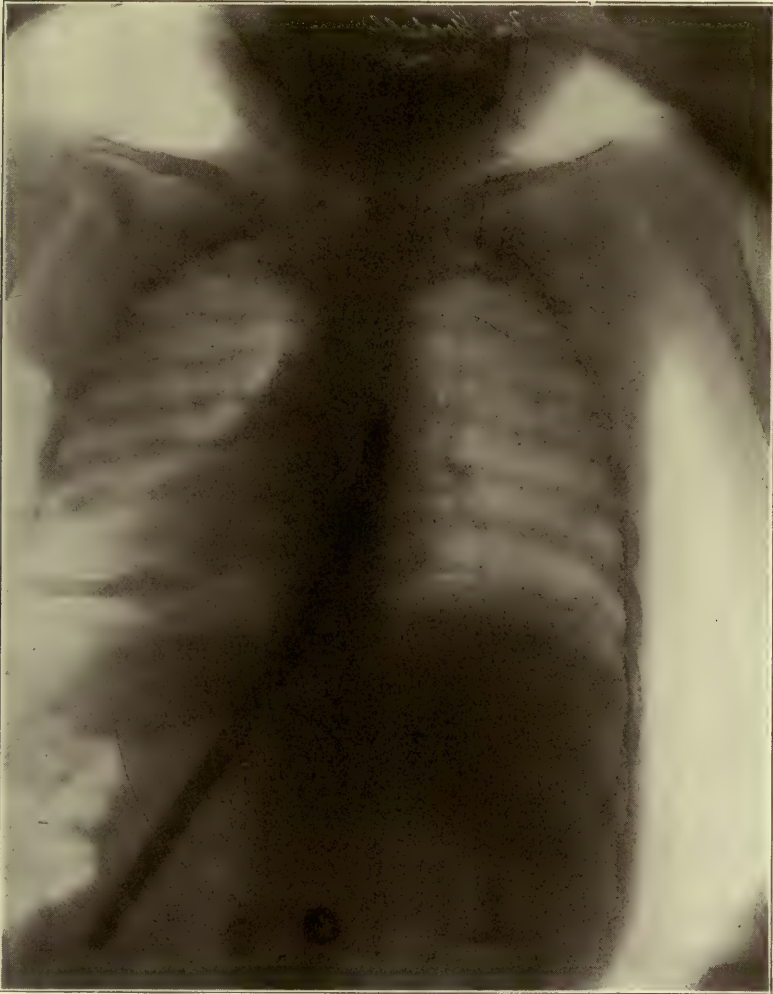


Fig. 2.—Roentgenogram showing rubber catheter in the esophagus and stomach (as a rule, a somewhat shorter tube should be used).

The guide string under tension almost infallibly guides the catheter through the stricture without the fear of perforation.

The catheter itself by its very presence as well as by the motions imparted to it from the gastric and esophageal contrac-

tions tends to soften the walls of the stricture and promotes resorption. Thus continuous, gradual and safe dilatation is obtained.

The catheter serves as an excellent conveyer of food while the treatment is being carried on. Some food doubtless passes along the outside of the catheter.

The stricture having been dilated, subsequent treatment with the Plummer olives, electrolysis and the like may readily be carried out.

As a measure of precaution prolonged contact of the catheter with the cricoid cartilage should be avoided to prevent ulceration in this region.

In regard to the etiologic factor in the case described above, considering the prevalence of scarlet fever, it is exceedingly fortunate that esophageal stenosis is a rare complication of the disease. I have been able to find seven cases in the literature. (Henoch,¹⁵ Hagenbach,¹⁶ F. Ehrlich,¹⁷ von Eiselberg,¹⁸ Boaz,¹⁹ Knopfmacher,²⁰ Sargnon²¹).

Severe scarlatinal infection associated with deep ulceration in the fauces seems to predispose to ulceration and subsequent stenosis of the esophagus.

DISCUSSION

DR. JOHN W. MURPHY, Cincinnati:—I think we are all indebted to Dr. Iglauder for bringing a case of this kind before the Society, and showing the ingenious method by which he was able to overcome many of the difficulties we encounter in cases of stricture of the esophagus. When the stricture has become so narrow that it is next to impossible to get even a fine probe through the stricture, the difficulty becomes very great. If a small channel is present sufficient to allow the patient to swallow a thread, to which a small shot has been attached, we may be able to have the patient swallow sufficient thread to anchor the lower end well in the intestine. It is surprising how a thread may be anchored in this manner. With this thread as a guide, a bougie may be passed and made to follow the irregular channel, since these strictures are never straight, but often form an S-shaped scar, which renders the passing of the bougie exceedingly difficult. Dr. Iglauder and I had a case recently which showed the great difficulty encountered in passing a very tight stricture caused by swallowing lye. The case came to the hospital from the mountains of West Virginia. The patient was a boy about 8 years old, and, as no opening whatever was present in order to furnish nutrition, an opening had to be made into the stomach. After the child had recovered from the stomach operation, Dr. Iglauder passed an esophagoscope through the mouth, while I passed a Jackson bronchoscope through

15. Henoch: *Vorlesungen u. Kinderkrankheiten*, Berlin, 1899.

16. Hogenbach: *Ref. Henoch*, *Op. cit.*

17. Ehrlich, F.: *Berl. klin. Wchnschr.*, Oct. 17, 1898, No. 42.

18. v. Eiselberg: *Ref. Ehrlich*, *Op. cit.*

19. Boaz: *Deutsch. med. Wchnschr.*, 1905, xxxi, 281-283.

20. Knopfmacher: *Ref. Guisez*, *Arch. Int. de Laryngol., d'Otol. and Rhinol.*

21. Sargnon: *Province Med.*, Jan. 27, 1912.

the stomach opening, upward, until our instruments were as near together as we could bring them on account of the stricture. Dr. Iglauer was then able to see the reflection of my light through the stricture, and attempted to separate the stricture by means of a cautery point. We then passed a bougie through the opening, and we supposed the bougie was passing into the stomach. Presently I detected the bougie in the wall of the stomach; then we discovered that we had not entered the lumen of the esophagus, but had passed between the mucous membrane and the muscular coat of the esophagus. A day or two later the father insisted upon taking the child home, against Dr. Iglauer's advice. After reaching home, he said the child was able to take a fairly good meal on the way home and he thought the child was much better. Just what occurred to enable the child to swallow we do not know. The child died several weeks later, and, as we were not able to get a postmortem, we do not know whether we had set up an inflammation in the mediastinal space that hastened the fatal termination.

I think radium may be of benefit in these cases. I had one case recently, in which a growth was occluding the lower end of the stomach in a patient 56 years old, who was not able to swallow fluids any longer. A tube of 40 mm. of radium was placed in the stricture, by means of the esophagoscope, and left there for twelve hours. An opening was then made in the stomach, through which the patient was nourished, while we were waiting results of the radium treatment. The patient was able to swallow fluids again in the course of two weeks. She returned to her home, and we were preparing to close the opening in the stomach, when she developed pneumonia and died. Here also we were not able to secure a postmortem, and hence the great value of the case from a scientific standpoint was lost.

I feel that while these cases look very desperate at times, if we are able to get a soft catheter through the stricture the narrow opening may be enlarged by the constant action of the rubber tube, and larger and larger tubes may be passed.

I think from Dr. Iglauer's experience, we will be careful to anchor the catheter to prevent its slipping through into the stomach; yet, as you saw in this case, no serious damage resulted.

DR. JOHN H. JAMES, Mankato, Minn.:—I think I cured the first case of esophageal stricture in this country by dilatation. About 1877 I was connected with an insane hospital at St. Peter, Minn. A child 8 years old in the town had swallowed concentrated lye. Some months later a stricture of the esophagus followed. The attending physician asked me if I could pass a tube into the stomach. I was in the habit of passing tubes to feed insane people. We had in the hospital some very old urethral bougies which were very hard with age and not very limber. We attempted to pass one about 3 mm. in diameter and failed. The stricture seemed to be about an inch above the cardiac orifice of the stomach. The next day we attempted it again with a smaller instrument and succeeded in passing it after some little time. I continued to pass tubes every day, each day trying a little larger tube until I was able to pass one about 4 mm. in diameter. The doctor's brother was a surgeon and went with me one day and I told him to take hold of the tube and see how firmly the stricture grasped it. He took hold of it firmly and yanked it out and there was a free hemorrhage. He had lacerated the stricture. It was almost two weeks before I could pass as large a tube again, but we continued to do that and I sent to all the instrument makers for the different apparatus that was made at that time and I found nothing would answer except the hardened urethral bougies. Then as the stricture became dilated a little I passed a soft

rubber catheter over these. The case was cured after a few months and is still living today. I corresponded with every noted surgeon in the United States and found that none of them had heard of a case being cured, but I found one record of a surgeon in London at that time who had reported a case cured. Shortly after that I got a letter from a lady down in Illinois who had a similar case in her family. They had taken her to the Iowa City Hospital and surgeons there had given up the case; they then took the child home and the father got the idea that perhaps he could learn something so he gave the child some milk to drink, then he made her swallow some vinegar, then he turned the child bottom up and she vomited a cast of the esophagus, which showed the stricture. He went to work to cure this case himself. You will find a report of the case in Volume 20 of the *New York Medical Record* under the misnomer "Stricture of the Stomach." Three or four years ago this same method of swallowing a string was reported by one of the Mayo Clinic men, but I think they put a small shot on the end of the string and then dilated over this string with a catheter or hollow bougie.

DR. G. C. HALL, Louisville, Ky.:—I want to congratulate Dr. Iglauer on this case. I think we all realize the difficulties in this class of cases. I want to emphasize the fact which he mentions in his paper, that unless these cases are in extremis and a gastrostomy is necessary to save the patient's life, it would be very much better before any instruments are used to have a radiogram taken after a dose of bismuth.

I do not think it is wise, especially in cases of cicatricial stenosis, to attempt a blind passage of any instrument for the purpose of enlarging a stricture. We can have a much better knowledge of the situation through a radiogram and examination with the esophagoscope.

DR. SAMUEL IGLAUER (closing discussion):—In the case Dr. Murphy referred to in which we transilluminated an obstructing web in the esophagus, that was an experiment of course. The doctor was working from one end and I was working from the other. We were working both ends against the middle. Now when we had the lights lined up I proceeded to go through toward his light with a cautery. Then I put a filiform guide through the diaphragm and he thought he saw it coming. I continued to push on the filiform, but it did not get into the lumen of the tube. It dissected up the wall of the esophagus and entered the stomach. The patient, as the doctor says, was taken home against my wish and he died after three weeks. He continued swallowing in the natural manner up to the time of his death. In any event if I had another similar case I would try to transilluminate again using the Jackson light. The only alternative would be some external operation. In regard to the case reported by Dr. James he is to be congratulated on his ingenuity especially if you consider that he did not have the x-ray and the esophagoscope to aid him. The method of Berry was subsequent to his case but it was the same idea. I would hardly say that we should do much work in the esophagus without the esophagoscope, but I think if we know that the guide-string is in the stomach and we have an x-ray picture, we can do without the esophagoscope at times.

SOME CLINICAL ASPECTS OF SINUS THROMBOSIS WITH SPECIAL REFERENCE TO THE PATHOLOGY *

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Sinus thrombosis presents a variable clinical picture. The presence of chilly sensations or a distinct chill—a temperature curve showing a rapid rise and fall, a blood stream containing living streptococci—these findings give a familiar symptom-complex. Deviation from the so-called classical clinical picture, and variations of it studied in regard to the existing pathologic lesions give interesting data of which comprehension is not so common. With a view to accentuate and familiarize the varying types, the following twenty cases are presented:

Analyzing the case histories presented above, a few words are necessary on the pathologic conditions which were uncovered.

The mastoid lesions found were (a) of the coalescent type; (b) of the hemorrhagic type; (c) of chronic mastoiditis; (d) entire absence of mastoid cells.

By the coalescent type of mastoid lesion is meant that form of mastoid involvement in which the intercellular walls become broken down and coalesce. The mastoid process becomes more or less filled up with detritus and the sinus is reached by the lesion through contact. Technically a perisinus abscess is very often present, and the sinus wall is either necrotic or discolored or covered with granulations. Of the group of cases here reported five presented this type of mastoid lesion, and four of these gave a diseased appearance of the sinus wall.

The thrombus is formed in this group of cases as a defense placed by Nature to protect the blood stream against the invasion. The thrombus forms and is at first sterile, and only secondarily becomes infected.

Secondary lesions are uncommon in this group, and recovery of the patient is the usual outcome, when surgical interference is promptly instituted.

* For the purposes of this paper, the detailed case histories are unnecessary. In the presentation before the Academy, a lantern-slide demonstration of the pathologic lesions and temperature charts was given in more detail than is possible here.

THE BLOOD STREAM

INVASION OF

SEPTIC PICTURE OF

AND BLOOD PICTURE OF

CLINICAL WITH

CASES

No.	Identification	Age	Duration	Type of Mastoid Disease	Anatomical Anomalies	Blood Report	Clinical Picture	Appearance of Sinus Wall	Intermittent or Secondary Lesions	Thrombus	Result
1	Chas. Wil.	45 yrs.	5 mos.	Coalescent.	Sinus far forward Dissecting mastoid process	None taken	Not septic.	Granulation on sinus	None.	Clot found	Recovery
2	B. S.	6 yrs.	3 days	None present.	Absence of all cells in mastoid process	None taken	Not septic.	Normal.	None.	Clot found at autopsy	Death
3	D. D.	14 mos.	10 days	Coalescent.	Nothing unusual.	Positive.	Septic curve.	Normal.	None.	Clot found	Recovery
4	Sch.	25 yrs.	Unknown	Chronic mastoiditis	Nothing unusual.	None taken	Septic curve.	Normal.	None.	Clot found	Recovery
5	McD.	32 yrs.	3 wks.	Coalescent.	Nothing unusual.	Positive.	Septic curve.	Discolored and granulations	None.	Clot found	Recovery
6	Mrs. Rap.	?	1 wk.	Hemorrhagic.	Nothing unusual.	Negative.	Septic curve.	Normal.	None.	Clot found	Recovery
7	M. C.	27 yrs.	2 wks.	Acute exacerbation of chronic mastoiditis	Nothing unusual.	Positive.	Septic curve.	Sequestra in-larab involving sinus wall; granulations, discolored	None.	Clot found	Recovery
8	A. D.	6 yrs.	2 wks.	Hemorrhagic.	Nothing unusual.	Not taken.	Septic curve.	Normal.	Left knee joint inflamed; abscess between shoulder blades; endocarditis	Clot found	Recovery
9	H. W.	24 yrs.	1 wk.	Not stated in record	Very narrow, deep mastoid; sinus very far forward	Positive.	Septic curve.	Normal.	Right knee joint diseased	Not found	Recovery
10	Mrs. R.	45 yrs.	3 wks.	Not stated in record	Nothing unusual.	First negative; later positive	Septic curve.	Normal.	Left lobar pneumonia; abscess in right axilla; left knee joint abscess	Clot found	Death
11	A. W.	27 yrs.	5 days	Chronic mastoid	Entire mastoid sclerosed	Positive.	Septic curve.	Perisinus abscess; pus in bulb	Pneumonia; meningism from sepsis	No clot found	Death
12	Rose F.	12 yrs.	Unknown	None; Case operated upon for persistent postauricular fistula	Sclerosed mastoid	Negative.	Septic curve.	Normal.	Septic meningitis	Clot found	Death
13	J. F.	46 yrs.	Unknown	Chronic mastoiditis; acute labyrinthitis	Sclerosed mastoid	Positive.	Septic curve.	Normal.	Septic meningitis; pneumonia	Clot found	Death
14	Baby C.	2½ yrs.	1 wk.	Hemorrhagic.	Nothing unusual.	Not taken.	Septic curve.	Normal.	Endocarditis.	Clot not found	Recovery
15	Baby S.	2 yrs.	10 days	Coalescent.	Very pneumatic mastoid	Not taken.	Septic curve.	Normal.	No lesion found, but daily convulsions and high fever until sinus was opened and ends plugged off	Clot not found	Recovery
16	Sid. M.	3 yrs.	4 wks.	Hemorrhagic.	Abnormally thick cortex	Early negative; late positive	Septic curve.	Normal.	Cavernous sinus thrombosis	Clot not found	Death
17	Mrs. O'e.	25 yrs.	1 wk.	Hemorrhagic.	Nothing unusual.	Positive.	Septic curve.	Normal.	Abscess in 5th phalanx left hand, inflamed right knee joint, abscess on back over crest of ilium	Clot not found	Recovery
18	Louis Mich.	9 yrs.	3 wks.	Chronic mastoid	Nothing unusual.	Positive.	Septic curve.	Perisinus abscess; granulations on wall	Abscess temporosphenoidal	Clot found	Death
19	Fern.	50 yrs.	Unknown	Coalescent.	Nothing unusual.	Negative.	Septic curve.	Granulation; necrotic sinus wall	Leptomenigitis.	Clot found	Death
20	Morris Less.	47 yrs.	21 days	None present.	Absence of all mastoid cells in process	Positive.	Septic curve.	Normal.	None.	Clot found	Recovery

The thrombus was demonstrable in four cases, and not found in one of this group. Of this group four recovered and one died. The case which died presented in addition to the sinus involvement a general purulent meningitis.

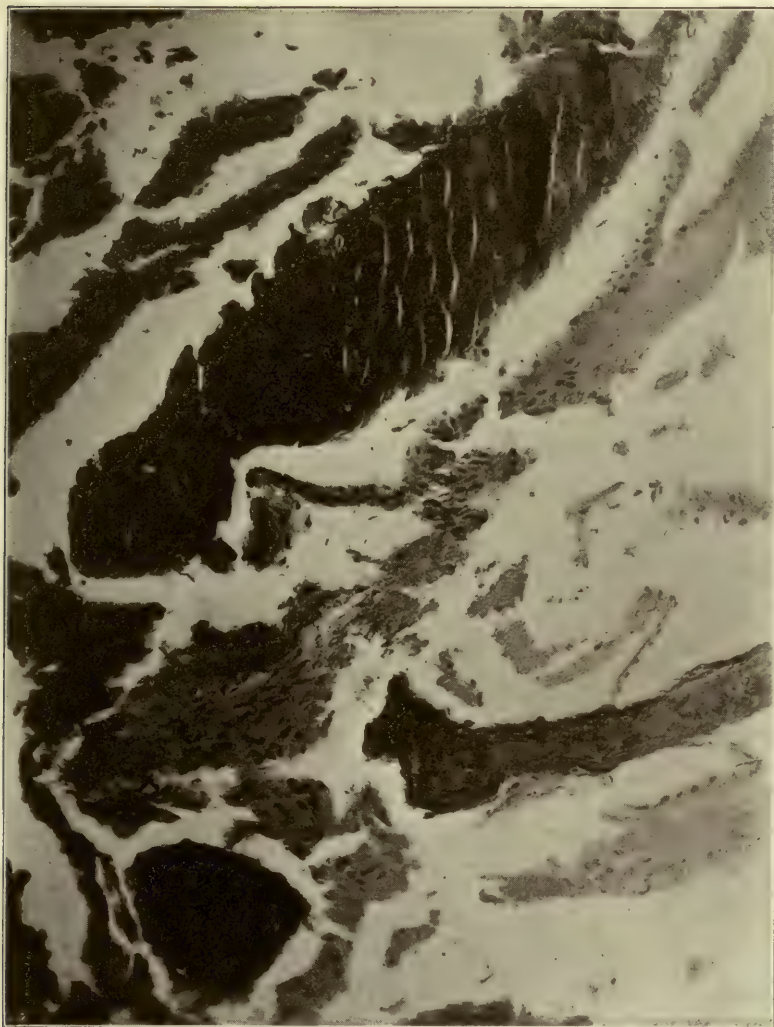


Plate I.—Coalescent mastoiditis. The loss of nuclei in the bone is seen. The general destruction of cell walls is noted. Detritus and pus fill the spaces taken up by the cells. (Author's specimen.)

By the hemorrhagic type of mastoid lesion is meant a mastoid involvement whose most characteristic lesion is usually presented in true influenza infections of the mastoid process. In this type of lesion, the bony walls separating the mastoid cells from one

another are not broken down. Their lining mucosa is thickened and infiltrated with hemorrhagic infections. One sees on microscopic sections taken from this type of lesion, the intact bony



Plate II.—Hemorrhagic mastoiditis. The bony cell walls are intact and normal. The marked swelling of the mucosa. The large numbers of blood vessels, and the enlargement of these vessels is characteristic of this type of lesion. (Author's specimen.)

walls, the very much swollen appearance of the mucosa, and the great engorgement of the blood vessels with their interior filled with blood cells. This blood-vessel engorgement gives the type its

characteristic name, and is the distinguishing lesion. The infection is situated in the mucosa and in the blood vessels. Clinically such cases are very septic, and the septic material reaches the larger vessels and eventually infects the sinus.

The thrombus which forms in the lumen of the sinus grows *without* making any abnormalities apparent on the sinus wall. The thrombus is infected primarily. We must still look upon the formation of the thrombus as Nature's effort to stop the entrance into the circulation of septic material, but because the particles of infected matter are in the blood stream from the start,

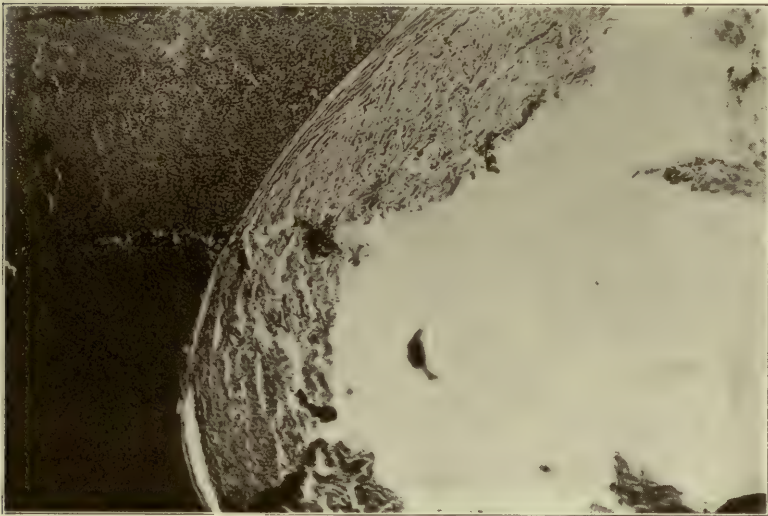


Plate III.—Jugular wall. Very much thickened and indurated. From a case with no thrombus in the sinus. (Author's specimen.)

before the thrombus can form, therefore, secondary lesions are common with this type of case. In fact, they often develop simultaneously with the growth of the clot in the sinus. With the newer means of making early diagnosis—blood culture—it very often happens, that no appreciable clot is demonstrable, yet the opening of the sinus and the resection of the internal jugular stops the septic course of the disease and recovery ensues. Thrombi were found in two cases, and were not demonstrable in three.

That the jugular vein may be the seat of inflammatory lesions, in cases where no thrombus is demonstrable is shown by examination of the walls of such veins. Figure 3 is from such a case. (Case 17 of the chart.)

The hemorrhagic type of mastoiditis was found five times among our cases. The appearance of the sinus wall was normal in all five of these. The blood culture was positive in two, was not taken in one and negative in two.



Plate IV.—Chronic mastoiditis. The bony partitions are thickened and hardened. The mucosa is swollen. Detritus is found in the air cells. (Author's specimen.)

Secondary lesions were found in four of them. In one the secondary lesion was a cavernous sinus thrombosis. The joints and muscles were the seat of abscess formations in two and the

endocardium was involved in one. Of this type of lesion, there were four recoveries and one death.

The sinus gave a thrombus in five cases whose mastoid process was the seat of a chronic mastoiditis. By chronic mastoiditis is meant a case which presents a chronic otorrhea for a number of years, or whose mastoidal lesion demonstrates a lesion as the result of the presence of cholesteatomata; those due to caries and necrosis, or those in which a chronic suppuration of the tympanic mucosa presents an acute exacerbation.

In most of such cases the sinus is reached through contact, or through purulent tracts extending to the sinus through a more or less sclerosed bony mastoid process.

Very often the onset of the invasion of the blood vessel marks the commencement of the acute illness. This type of mastoid lesion was found five times. The blood culture was positive four times, and in the other case was not taken. The sinus wall was normal in appearance in two cases; it was pathological in three. A thrombus was demonstrable in four of the cases, and no clot was found in one of them. This case, however, gave free pus from the bulb and no bleeding from the jugular dome. The thrombus seemed to have undergone degeneration.

Secondary lesions among this group of cases were common. Pneumonia was presented three times, and one case presented a brain abscess. The absence of a secondary lesion was noted once.

Because of the frequency of the secondary lesions, the percentage of recoveries in this group is small. There were three deaths and two recoveries in this group.

Among the cases whose history constitutes the basis of this report are two of a type which the writer first described in a preliminary report published in the *Laryngoscope* March, 1915..

These cases are characterized by an anatomical anomaly. The mastoid process presents externally a normal topography as to its cortex. There is, however, an entire absence of mastoid cells in its interior. I presented the first case of this type before the Otological Section of the New York Academy of Medicine on Oct. 9, 1908. Since then I have collected six specimens of temporal bones of this type and one other case reported in the *Laryngoscope* March, 1915.

The middle ear in these cases is first involved, and from the mastoid antrum, which is the only cell present, the disease spreads either by contiguity or through the network of venous channels, directly to the sinus and infects it. Clinically this group of cases is usually not placed under otological supervision. The absence

of pain referable to the ear, the sudden onset of septic symptoms give rise to such errors of diagnosis, that the cases remain under the supervision of medical men, and the fatal termination often precedes a recognition of the condition.

Of this group, I present two cases in this study. In the first the autopsy revealed the condition. The other case was happily diagnosed in time for surgical interference to save life. In the latter case, the positive blood culture preceded the demonstration of the thrombus.¹



Plate V.—X-ray photograph of the temporal bone of adult male about 32 years of age. Absence of mastoid cells, close juxtaposition of venous channels to middle ear shown by wire placed in sigmoid sinus groove, in middle ear and antrum, and in dome of jugular bulb. Photographed from above.

The character of the mastoid lesion is not noted in the records of three of the cases. Of these one gave a normally appearing sinus wall, but a positive blood culture, and the clot was demonstrable. The second gave a positive blood culture late, earlier

1. For details of this case see *Laryngoscope*, March, 1915.

cultures being negative. In this case a clot was found. In both these cases secondary lesions were presented. In the first a lobar pneumonia, and abscesses of the knee joint and axilla, and in the second a knee-joint suppuration. The first case died, the second recovered.

The third case in this group was Case 12, Chart 1. Here operation had been performed on the mastoid some months previously, and there resulted a persistent postauricular fistula. The patient was admitted for and a plastic operation was performed on her to close this fistula, and after a week's time septic symptoms came on. The blood was negative, and the sinus wall normal in appearance, but a thrombus was found. The patient died of septic meningitis. Summarizing our observations, we have the following:

	CASES
Number studied.....	20
Hemorrhagic type of mastoiditis in.....	5
Coalescent type of mastoiditis in.....	5
Chronic mastoiditis in.....	5
Absence of mastoid cells in.....	2
Mastoid lesion not recorded in.....	3
Secondary lesions were present in.....	12
Sinus walls were normal in.....	14
Sinus wall was pathologic in.....	6
Thrombus demonstrable in.....	15
No clot in sinus in.....	3
Sinus not opened in.....	2
Blood culture positive in.....	11
Blood culture negative in.....	3
Blood culture not taken in.....	6
Death with thrombosis only in.....	1
Death with secondary lesions in.....	7
Total deaths	8
Recoveries with thrombosis in.....	7
Recoveries with secondary lesions in.....	5
Total recoveries	12

A brief note on the surgery instituted. Excepting Case 2, Chart 1, where the condition was only found at autopsy, surgical procedures consisted in opening the sinus, removing the thrombus, and resecting the internal jugular vein.

In Cases 14 and 15, Chart 1, surgical interference was limited to opening the sinus. No procedures were instituted upon the jugular. This often suffices in children.

In Case 9, Chart 1, surgery was limited to opening the sinus. The bulbar end was found free from clot, and a plug shut off the circulation from further invasion. All these cases recovered.

In one, Case 13, Chart 1, it was impossible to find the internal jugular vein.

From these observations we may draw the following conclusions:

1. The type of mastoid lesion is an important factor in determining the gravity of a given case of sinus thrombosis.

2. The hemorrhagic type of mastoiditis presents secondary complications more frequently than do the other types of mastoiditis.

3. The normal appearance of a sinus wall is no indication as to the presence or absence of a thrombosis of the sinus.

4. Since infection of the blood vessel wall may proceed in either direction, that is, either with or against the direction of the blood current, the resection of the internal jugular is recommended in spite of a normally appearing sinus wall, and the failure to demonstrate a clot within it, where septic temperature continues and a positive blood culture is found.

5. In the absence of a positive blood culture, with pyemic symptoms, and conditions presented as in Paragraph 3, with advent of abscess formations in muscles or joints or endocarditis, a resection of the internal jugular is recommended.

6. Secondary lesions, excluding meningitis, while aggravating the gravity of the prognosis, do not necessarily mean a fatal prognosis. Of my twelve recoveries, five had secondary lesions.

THE USE OF BLOOD CLOT IN MASTOIDECTOMY

J. G. PARSONS, M.D.

SIOUX FALLS, S. D.

The use of the blood-clot dressing has received considerable attention at the hands of surgeons at different times. The writer does not pretend to add anything new to what has already been presented, but believes that a fair consideration of the subject, with the recording of experiences therewith and certain observations as to the causes of success and failure in its use in the mastoid operation, will be of value.

John Hunter called attention to the organization of the clot under a scab, bringing about union even when the parts were not in contact. He expressed himself in the following significant words: "Many wounds ought to be allowed to scab in which this process is now prevented; and this arises, I believe, from the conceit of surgeons who think themselves possessed of power superior to Nature, and have therefore introduced the practice of making sores of all wounds."

Schede, in 1886, presented his classic contribution "*Ueber die Heilung von Wunden unter den feuchten Blutschorf*," which has been pronounced by Halsted as the greatest contribution to surgical technic since the introduction of Listerism.

In the same year Blake applied the principles laid down by Schede to the mastoid operation, meeting with some remarkable successes, as well as some pronounced failures.

In brief, the technic of the blood-clot dressing consists in closing up the cavity from which bone has been excavated, allowing it to fill with blood, which serves as a natural dressing to the wounded bone surface. As pointed out by Hunter, and elaborated upon by Schede and subsequent writers, the blood clot so formed under favorable conditions becomes organized and forms a fibrinous network on which granulation tissue is deposited. Osteoblasts creep out from the raw surface of the bone and the cavity becomes filled with a lattice-like mass of osseous and connective tissue. As Hunter puts it: "This is Nature's own method."

It is evident that if we could always depend upon a favorable progress of a case after operation this would be the ideal method of handling mastoid operations.

Unfortunately there are a number of things which militate against the ideal conditions desired. This has led to the abandonment of the method by some who have tried it, and its condemnation as irrational and unsafe by those who have not.

The thing which is most feared is infection of the clot, which is supposed to be a culture medium par excellence, and all sorts of dire results are conjured up as a consequence.

It is argued that it is impossible to remove every bit of infectious material and that the residuum will inevitably multiply rapidly, causing a breaking down of the clot and possible serious septic results.

Mechanical obstructions to healing, such as spiculae of bone which have escaped attention, shreds of devitalized tissue and gauze fibers may also be considered as sources of trouble.

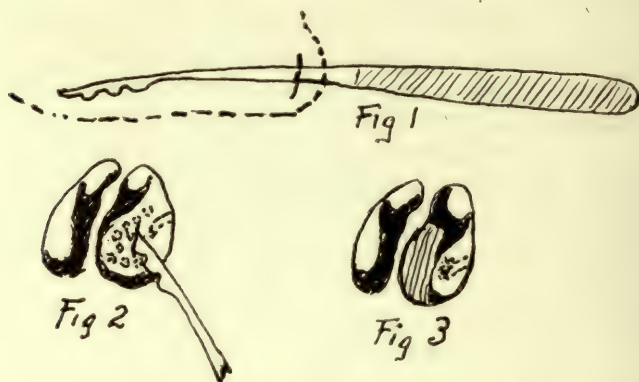


Fig. 1.—Parsons' Turbinate Knife in turbinal bone.

Fig. 2.—Knife entering engorged turbinal, showing relation of dilated erectile tissue to bone.

Fig. 3.—Contraction of erectile tissue and anchorage of scar to periosteum after operation and packing with Simpson tampon.

It is evident that if we can recognize the causes of failure we ought in a great measure be able to avoid them by perfecting our technic as occasion demands. If it can be shown that in spite of the disadvantages of the clot there are advantages gained which outweigh, namely, shortening of the time required for healing, better cosmetic results and less discomfort to the patient, with hearing results equally as good, it would appear reasonable to claim that in cases for which it is suitable, the blood-clot method is superior to the methods which are ordinarily in use.

Concerning the danger of infection of the blood clot: The relatively radical excavation made in the modern mastoid operation goes a long way toward eliminating the liability of leaving behind infected bone, as was frequently the case in the early

days of mastoid surgery. The writer believes that it is essential to the thorough performance of this excavation to have strong artificial illumination on the field of operation, and would lay stress on a good headlight as an important part of the instrumental equipment.

Our knowledge of the behavior of healing blood clots has made advances. We now know that the normal bactericidal properties of blood enable it to hold its own against infection for at least forty-eight hours. The failure of a clot to hold its own for that length of time is due in almost every instance to chemical disturbances which have been set up by the presence of antiseptics.

Careful technic in preparing the field of operation and in closing the skin will make it possible to avoid infection from the outside.

Free and continuous drainage of the tympanic cavity through an adequate opening in the drum head will, by capillary attraction, draw away most of the infection which might attack the clot from the tympanic side.

It is maintained that if thorough clearing out of infected tissue has been done under aseptic precautions throughout, no antiseptics have entered the wound to impair the resistance of the bloodclot, and free, continuous drainage from the tympanic cavity through the external canal is maintained there will be, in most cases, primary union of the mastoid wound and rapid healing of the middle ear.

Reik of Baltimore has reported some time ago a series of fifteen consecutive unselected cases of primary union.

A further argument against the fear of infection of the clot may be mentioned. Most rhinologists have abandoned packing the nose after ethmoid operations mainly because of the danger from the extension of infection. In the absence of packing the cavity, which is anything but aseptic, it fills with a blood clot, and no great amount of anxiety is felt. In the mastoid region there is far less liability of absorption of infection into the cranial cavity. Why, then, should there be greater fear of the blood clot there than in the ethmoid?

However, let us suppose that, either through faulty technic or some unavoidable condition we do not secure primary union. The blood clot, having held its own in spite of infection for forty-eight hours, has given opportunity for osteoblasts to start from the surface of the bone, and considerable granulation tissue has already formed which will persist after the clot breaks down. It is obviously much easier for these developing cells to project

themselves through a soft medium like blood clot, and on a scaffolding of fibrinous network, than to force their way against gauze with which the wound is packed in the open method. The start obtained during the persistence of the clot is enough to materially shorten the time required for filling in the cavity with granulation tissue.

If it becomes necessary to pack the wound, the removal of one or two sutures is all that is necessary to convert the wound into an open one which may be treated in the ordinary manner. The fears concerning unusual results following infection having been disposed of, and assuming that this method is justifiable as a rational procedure, we may mention the technic.

The skin is prepared in the ordinary manner, using iodine for the sterilization. Especial care is taken to avoid laceration of the periosteum in elevating. Thorough excavation under strong illumination from a headlight is done, carefully wiping out all detritus with sterile gauze. All loose tags of tissue are trimmed off. No antiseptics of any kind are used in the wound, which is sutured completely, using either a subcuticular stitch or clips. In the lower angle of the wound a few strands of silk are inserted to act as a safety valve for any excess of serum which might distend the wound during the first day. This silk drain is removed in twenty-four hours.

A loose sterile gauze drain is inserted in the external canal as far as the drum head, which should be freely incised, if need be, to care for drainage of the tympanic cavity. This drainage must be kept working freely, changing the wick daily or oftener. The mastoid incision is covered with a sterile dressing which is removed daily for inspection of the wound, when, if indications point to the necessity for external drainage, it can be opened, and a small gauze drain inserted in the usual manner. The sutures are removed on the fifth day. Under favorable conditions primary union results, with a slight scar and scarcely any deformity.

In cases where it is necessary to pack, because of breaking down of the clot, the length of time required for healing is greatly lessened, amounting from one to three weeks.

There are certain limitations to the usefulness of this method. It would be unwise to use it where there is any brain or sinus involvement rendering external drainage imperative. However, the mere fact that a healthy sinus or dura has been exposed is no contraindication to the use of the blood clot. In fact, it is a source of protection to these areas.

In radical cases the blood clot is also advantageous. Cornelius Williams has shown that by its use we may simplify the operation by rendering unnecessary the use of flaps and grafts.

With the usual technic up to the point of closing the wound the membranous canal is trimmed smooth, beveling off the posterior edge, and is replaced in the cavity in its normal site. A light packing of sterile gauze is inserted to occupy the space normally occupied by the tympanum. The posterior wound is closed as in the simple operation. The clot forms about the gauze in the tympanum. The gauze is removed on the third day, and is changed as often as is needed, daily or every second day as a rule. After a week's time iodoform gauze is substituted for the purpose of stimulating epidermization. The cavity, much smaller than that made where flaps are used, is usually completely dermatized in five or six weeks.

A few illustrative cases are reported herewith. No mention is made of the cases of primary union, which, in a series of about fifty, was secured in about 60 per cent.

J. J., aged 16. Acute mastoiditis of the Bezold type, with cervical abscess. Operation following usual technic, extending incision to accommodate drainage of cervical abscess. Small cigarette drain in lower angle of wound removed third day, leaving small cavity half inch deep, which was filled with boric acid powder. Cervical abscess packed daily. Stitches removed on fifth day. Cervical abscess seemed clean and was also filled with boric acid powder. Next day pus was found in neck and mastoid wound. Under a lysol pack both wounds cleaned up rapidly. On the eleventh day mastoid wound was solid, and cervical wound granulated in a few days. Very slight deformity.

M. L., aged 7. Acute mastoiditis following influenza. Child very irritable. Extensive development of cells. Wound closed with silk drain. Clot remained sound until fifth day, when it broke down, leaving a small sinus, which was packed lightly, without causing pain to the child. Wound completely healed on fourteenth day. No deformity.

J. O., aged 17. Chronic otitis media with acute mastoid involvement. Operation for tubercular glands of neck by general surgeon one week previous. Radical mastoidectomy as described. On third day (the tenth after operation on neck) the cervical wound broke down and was drained. On tenth day, mastoid wound which had been solid hitherto broke down. Patient was put on injections of tuberculin B. E. Both wounds healed promptly, the mastoid wound being completely healed one week after the wound broke down. The ear was completely dermatized in five weeks. Patient died two years later from tuberculosis, but the ear remained perfectly well, hearing ordinary conversation at 12 feet.

F. H., aged 6. Acute mastoiditis following chronic otitis media. Radical operation. Wound solid until fifth day when patient developed chicken pox, with numerous vesicles about ear and wound, which became infected. Wound was opened and packed lightly in the usual manner. Wound healed in eighteen days. Ear completely dermatized in eight weeks.

By the way of comparison with usual methods as far as the time factor is concerned the following is quoted from Oppenheimer: "In cases that run the usual favorable course the average time for epidermization is from three to four months, while in many instances five or six months elapse before the middle-ear cavities are dry and free from secretion. In the simple mastoid operation the usual time required for the process of healing is much shorter, being from four to six weeks on the average."

SUMMARY

1. Under proper technic in suitable cases the blood-clot operation for mastoidectomy is safe.
2. It saves from one to three weeks in time required for healing.
3. Primary union may be secured in the majority of cases.
4. Cases which do not heal by first intention are easily converted into open cases, and even then there is a saving in time.
5. The operation is of especial value in children where the pain of the dressings is a factor to be considered.
6. The cosmetic results are better than by other methods.
7. It simplifies the radical operation and saves time in the process of epidermization.

REPORT ON USE OF AUTOGENOUS VACCINES IN TREATMENT OF CHRONIC MASTOIDITIS AND WHEN THESE FAIL, USE OF BALLANCE FLAP FOR THE RADICAL MASTOID OPERATION

EDWARD J. BERNSTEIN, M.D.

KALAMAZOO, MICH.

Since the meeting of the Ninth International Congress of Otology, autogenous vaccine therapy in the chronic mastoid suppurations has received quite an impetus. At the time Dr. Nagle read her paper, considerable skepticism was felt and the writer among most others was quite sure that her statements would not hold; certainly those of us who had tried vaccine therapy were not very enthusiastic, to say the least. Since hearing her paper and rereading it, I have been impressed that much of my ill success was due to methods, if there was such disparity in our results.

Dr. Nagle's plan is as follows: An active vaccine is secured by having a virulent type of bacteria, by killing these at the correct time, before they begin to lose their cultural characteristics. And, it is essential in sterilizing the vaccine to subject it to the lowest heat for the shortest possible time which will kill the bacteria. The vaccine is made from the pus which is forced out of the drum cavity into the external canal, which latter has been cleansed and rendered sterile by 70 per cent. alcohol. The smear is cultured in the proper media—depending upon the organism—some growing well in one media and not at all in others. When the height of the growth is nearly reached, cultures are washed off the surface of the medium with normal salt solution, under sterile conditions and collected in one sterile tube. This is then sealed and subjected to the lowest temperature, for the shortest possible time to kill the organisms. The vaccine is then tested to be sure it is sterile. If not, the tube is again sealed and subjected to more heat, etc.

The dosage is a matter that must be studied in each individual case. Usually beginning with 0.10 c.c., increasing gradually to 1 c.c. and often to 2 c.c. There are cases in which dosage is rapidly increased after the first injection, where the exigencies of the case call for this, the systemic reaction being the guide. After discharge has altogether ceased, at least six

more injections in decreasing dosage, are given. For fuller details, refer to Dr. Nagle's report in the Transactions of the Ninth International Congress.

From my own standpoint it would seem that it is not wise to try this therapy in acute mastoiditis. Conditions are then too compelling and pain too urgent to temporize with any such means. This seems especially so in those cases when we are dealing with infection due to *Streptococcus capsulatus mucosus*, where the ravages are devastating in their rapid involvement of mastoidal structures. Doubtless, this is at odds with our ideas in other realms of surgery. I always take cultures and am ready to have vaccines made, if for any reason recovery is delayed in doing the simple in acute cases.

My experience is limited to forty-two cases of chronic suppurative mastoiditis, in which twenty-six, or 60 per cent., yielded in a very short time to this vaccine therapy, with no further treatment than simply mopping the canals after catheterizing the tubes to free them from accumulated pus.

Sixteen, or 40 per cent., went on to radical operation, in which I have employed the Ballance flap to complete the operation. By recovery I mean that for two years in some of the earliest cases, there has been no discharge and that many have gained remarkably in hearing. In not one of the vaccine cases has hearing been worse. I shall detail a few illustrative cases:

Dorothy W., aged 13. Has had running ear since she was 7 years old. Several times it seemed to have stopped, but I doubt that, as her mother often had to clean it of accumulated pus. Two years ago she had another earache with increased discharge. This is all to be obtained from the history.

On presentation to me, Sept. 20, 1913, I found the right ear canal full of pus; after mopping, a large polypoid mass nearly filling the entire anterior inferior quarter of the tympanum. Hearing reduced to whispered sentences at 1.25 mm. Watch on contact.

Cultures were made—*Streptococcus*, *Staphylococcus albus* and *Staphylococcus aureus*. Some *Xerosis bacilli*.

Local treatment consisted of catheterizing the eustachian tube and mopping the canal each day.

After second injection, the polypoid mass seems smaller and on the fourth, had disappeared.

After the seventh injection, the ear is dry and she hears whispered sentences at 11 mm. Six more injections were given and when discharged as cured the perforation had healed and hearing was for whispered sentences 13 mm. and my watch, which should be heard at 150 cm., was heard at 120 cm. The ear has been dry two years now.

Mrs. G., aged 49. Right ear began to discharge seven years ago. Always gave more or less trouble (discomfort and pus). Four years ago had an attack of great pain in that ear, for which she was treated in Chicago.

On presentation to me Oct. 20, 1914, there was very little secretion seen, but some cholesteatomatous masses in upper posterior region and ear looked as if a radical mastoid had been done—though nothing like this occurred. Hearing—whispered sentences at one-half millimeter and watch on contact. Has considerable pain in mastoid and zygomatic region. Has infected tonsils with which she refuses to part.

Cultures made show *Streptococcus* and *staphylococcus albus* and *aureus* and influenza bacillus.

Routine dry mopping locally; after the fourth injection, ear very much more comfortable; after the eighth, it was dry and gave six more injections.

February 1, three months after cure, the patient called on me and had gained 20 pounds in weight, and color of skin, which before was sallow and rough, was now ruddy and clear. Seen again on Aug. 18, 1915, for a tonsillar infection, but the ear was still dry. Hearing not improved.

Mr. A. V., aged 49. Discharging and fetid ears at least eighteen or twenty years; history indefinite. Had been under care in various parts of this country from New York to the Rockies in the different places he had lived, but had not obtained any relief. When seen, April 2, 1915, both ears were foul with fetid pus. The right ear showed less destruction, but more than half the tympanum was gone and drum cavity filled with granulations; cholesteatomata present. Hearing, right: whispered sentences at 6 millimeters and watch 30 c.cm.; normal, 150. Left ear: whispered sentences one-half millimeter; watch on contact.

Canal filled with fetid pus and when dried out all resemblance to an ear was gone. Simply looked like a blind pouch. Great masses of cholesteatoma.

My opinion given to him was that nothing short of a radical mastoid would be of the slightest use in the left ear, but it was possible that we might cure the right with vaccines. He was ready to have the mastoid done at once, but I suggested that inasmuch as his busy season was coming on, and that I could watch him, we would use the vaccines first and if it came to operation it would make his recovery that much the quicker. Accordingly, vaccines were made from the great mixture of organisms present. After the fourth injection, there was evidence of improvement in the right ear, but in a few days, despite injections, it was as bad as ever. We continued injections in greatly increased doses. After the tenth injection, the right ear was nearly dry and the left decidedly improved in odor and quantity and quality of the secretion. I must confess to a great deal of surprise in this latter result and was greatly encouraged to continue.

June 10 both ears were perfectly dry and have remained so since. He was given ten more injections, as I wished to fully establish a cure.

July 15, hearing right ear: whispered sentences, 10 mm.; watch at 120 cm.; normal, 150. Left ear: whispered sentences at 6 mm.; watch 40 cm. I am at a loss to understand why this man hears at all with either ear, as it is utterly impossible to differentiate any of the structures.

This one case, even had all the others been failures, is enough to establish the position of vaccine therapy, but with 60 per cent. of cures it would take a great deal to demolish my faith. As said previously, sixteen, or 40 per cent., required a radical mastoid and either because I had given them the vaccines first or because I have ended my radicals with the Ballance-Thiersch graft, I have never seen such rapid healing before and—this is entirely to the credit of the graft—never had such comfort for my patients or myself in the practically painless after-treatment in my twenty-four years as an otologist.

I shall not go into the details of Mr. Ballance's method, as they are familiar to most of you and can be read in his articles. On one point I should like to say a word and that is, that after the fourth or fifth day, there will be a voluminous outpouring of very offensive fluid. You will be inclined to think the whole operation has miscarried and everything has broken down. It need not alarm you in the least, for it is merely the upper layers of the epithelial graft which is being discarded, and if you have done a clean operation and been careful to have dried the operative field before applying the graft and have spread it out carefully, in a few days you will see the whole field nicely clothed with a thin layer of epithelial cells. You will be most agreeably surprised to find how little pain your after-treatment gives the invalid.

Of my sixteen cases, one a lady of 61 years, was entirely cured in fourteen days; three were cured in eighteen days; five were cured in twenty-one days; two were cured in thirty days; two were cured in forty days; one was cured in fifty days; one was cured in fifty-five days. One case required three months before the ear was dry. As far as hearing is concerned, my results are at least as good as the older granulation methods, and, I am inclined to think, somewhat better.

DISCUSSION ON PAPERS OF DRS. KOPETZKY, PARSONS AND BERNSTEIN

DR. JOHN W. MURPHY, Cincinnati:—I am very sorry indeed that Dr. Kopetzky was not able to demonstrate the rest of his slides, as I think he is bringing out a point of great importance to all men operating on the mastoid, and that is when and how are we to know when to

operate on the sinus. I think we all have a great deal of respect for the sinus and are not at all anxious to open it, as a new element of danger may enter into the case, so I never feel as comfortable after a mastoid operation in which the sinus has been in any manner injured as I do when the operation has proceeded without injury to this important structure. I believe we are all governed largely by the temperature curve in these operations. Where we have had the case under observation and operated, and the case seems to be making a normal recovery then in three or four days our temperature begins to go up and down, we become uneasy as to whether or not our sinus has become infected. I think Dr. Iglauer is here, and I hope he will in his discussion tell you of a case we had together recently. The same evening, I saw a case with Dr. Bledsoe that illustrates very clearly the point brought out by Dr. Kopetzky. Dr. Bledsoe had operated three or four weeks before and the case was having a normal convalescence when he began to have a septic curve. I could not make up my mind to reopen the wound, as Dr. Bledsoe had operated very successfully. I had not the courage to advise reopening that ear, although we had our septic curve, and I asked further consultation and Dr. Iglauer saw the case with us. We decided to make an exploratory aspiration of the sinus. The wound was reopened and the sinus examined by means of a hypodermic needle. We found the sinus fluid and this child, a boy 8 or 10 years of age, went on to complete recovery. Any one who has seen a sinus thrombosis does not doubt that he has a very sick patient. I think possibly Dr. Kopetzky may be along the right line when he says it was an osteophlebitis, as no other unfavorable symptoms resulted and the child got well. I think in all of these cases it is not sufficient to open up, and if you find an infected sinus you have not done sufficient simply to remove the clot. I get through drainage from both ends of the clot. If I cannot do it from the lower end of the clot I insist on resecting the vein, and the case that Dr. Iglauer can tell you about will show you the difficulty you sometimes find in having a collapsed vein.

I also wish to make a point as to the case where there was a fistula in the labyrinth. I think many of us would probably under those circumstances feel that the labyrinth operation should be done, and yet Dr. Kopetzky did exactly what I would have done in this case. I also have a great deal of respect for the labyrinth, and unless I feel it is absolutely necessary I think the patient is better off without the labyrinth operation. In the course of a week or two Dr. Kopetzky's patient returned with very serious symptoms of meningitis, and the natural supposition is that the infection went on through the labyrinth.

DR. GEORGE F. COTT, Buffalo:—This is about the last word on the pathology of the mastoid process and sinus thrombosis. I will touch one point, and that is the sinus thrombosis symptoms after operations. Also what caused the peculiar symptoms, I will not mention that. In all probability Dr. Kopetzky will in closing the discussion. Now you may have an operation and your patient may have a sinus thrombosis or chronic middle-ear suppuration or acute mastoiditis, and you get the typical sinus thrombosis temperature. Dr. Murphy mentioned a case like that. He opened up a second time which was absolutely wrong. You can have this typical temperature and your patient recover. I have charts here of five cases in which this occurred. The first one I operated and the other four I refused to operate and they all got well. Begin the use of Dr. Kopetzky's chart and you cannot get along without it. Before any serious symptoms are noticeable you will find the symptoms in the blood. Now I want to tell you why I thought the patient ought not to be operated on the second time. You have the typical

temperature after the operation, perhaps a week or two after. It means you should not operate because they will recover in every instance. They have no other symptoms besides the temperature and when you have the typical temperature and the patient feels good, eats, sits up in bed and sleeps well at night they recover without operation every time, no matter whether the temperature goes up 6 or 8 degrees.

DR. SAMUEL IGLAUER, Cincinnati:—Dr. Murphy has referred to one or two cases we saw together. The first was a boy aged about 10 years. He came to the hospital with earache, but he never had any discharge. A paracentesis was done the same evening, and the next day I operated on him. I made a probable diagnosis of sinus thrombosis. We found an abscess in the sinus and a flat jugular vein completely collapsed. Here was a case of sinus thrombosis without a running ear. That very evening Dr. Murphy asked me to see another case with Dr. Bledsoe, in which the patient had all the clinical symptoms of sinus thrombosis after an operation. In that case the sinus was exposed and found normal and the patient recovered. In other words he had the fever curve of sinus thrombosis and recovered without operation. Now it seems to me Dr. Kopetzky's remarks are based upon two fundamentals: First, the anatomy of the mastoid and its relations to the lateral sinus, and second, the pathology. Now if you put sinus thrombosis into its simplest terms it means infection by continuity of tissue. What Dr. Kopetzky says amounts to this: if the barrier between the middle-ear and sinus is thin infection may go through; if it is thick it takes longer. There are more trenches to be captured.

Osteophlebitic pyemia is based upon clinical facts. A patient presents the symptoms of sinus thrombosis, his mastoid is opened, the sinus is found normal and after that without attacking the sinus the patient gets well. In other words, the infection never reaches the lateral sinus, but is carried into the general circulation from the mastoid veins. I would like to suggest that in probably every case of mastoiditis you have thrombosis occurring in the mastoid veins. That does not prove anything in particular, because you will find this condition in cases of mastoiditis without metastases. Why is a mastoid small on one side and large on the other? From my x-ray studies I have come to the conclusion if you have a small mastoid on one side and a normal one on the other it means that some time in the early life of the patient he had an infection in his middle ear and that retarded the development of the mastoid. Thus an acute middle-ear infection leaves its mark behind.

DR. BANE, Denver:—Fortunately the three cases that I have observed following capital operations made a good recovery. I was pleased to hear Dr. Kopetzky state that when the sinus was found involved, the internal jugular was resected. Dr. Murphy referred to the examination of a case by means of a needle. I think puncturing veins gives no information. You want to get the vein open. This does no harm, and if you find an infected clot in there, stop, go down to the neck, resect the internal jugular, then go back and remove the clot from the vein, put in proper drainage and you may anticipate recovery.

DR. MARVIN M. CULLOM, Nashville, Tenn.:—I want to ask Dr. Kopetzky in his discussion to touch upon the point he brought out in regard to the labyrinth case in which the patient was admitted to the hospital with labyrinthine symptoms and the death of the labyrinth was observed. I would like to ask if he did not ignore the indication which is generally recognized for a labyrinth operation in that case. With the subsequent history would not it have been better surgery to do a labyrinth operation in that case?

DR. G. W. BOOR, Chicago:—I want to mention three cases of sinus thrombosis. In the first case the jugular vein was filled with pus and was closed by the thrombus so low down that it was not possible to ligate it. The vein was slit open, the pus evacuated and a drain inserted. The patient recovered. In the second case there was the same irregular septic temperature curve as in the first case. The thrombus was turned out of the lateral sinus without ligating the jugular. The septic temperature continuing, I cut down on the jugular vein a few days later with the intention of ligating it but found it filled with an organized thrombus, so did not disturb it. This case also recovered. In the third case I had operated on an acute mastoiditis in a child. The irregular temperature continued, but no further operation on mastoid or sinus was done. The postmortem showed endocarditis, purulent choroiditis, abscesses in the spleen, lungs, kidneys, mesentery and elsewhere, but no thrombus in the lateral sinus. These three cases show some of the difficulties in sinus work.

DR. PYFER, Norristown, Pa.:—In Dr. Parson's paper he speaks of leaving some strands of gauze in the bottom of the wound. This is not carrying out the technic of the blood clot. Dr. Reik of Baltimore insists upon a wound free from any foreign body. The difficulty experienced by men who follow Dr. Reik is that they put their own individuality into the operation. Dr. Beck, I think, has reported nonsuccess in the blood clot, but he used a stab wound behind with sterile drainage and Reik insists that is not the technic. Following Reik I had a series of cases where I had success with the blood clot, but unfortunately in the next series of about eight cases all failed. I wrote to Reik regarding it, and he said he too has had his series of failures, but he always searched for the trouble and he found some loss of technic. Even with failure the patient is in a better condition than otherwise, the wound heals up, and danger can be disregarded. In my first case, I did not see the patient for two days; when I did the whole side of the face was swollen. As soon as I removed the stitches and cleaned out the wound, recovery was very rapid. In Dr. Bernstein's paper he says he uses autogenous vaccines in cholesteatomatous mastoids. I really think this should be a preliminary report, for subsequent reports will show they were not of value.

DR. J. C. BECK, Chicago:—I would like to take the privilege of saying something in appreciation of these papers because they have brought out very important facts; at least if not facts they have offered suggestions and we can work further on this subject. In the first place in Dr. Kopetzky's work, due credit is not given to Gruening who is the man who paved the way from the pathological point of view. Eight years ago I showed a number of pathological conditions examined after operations and some of them were sinus thrombosis cases. At that time I showed two types of mastoid of an acute form, one of which I called the thrombotic type and the other the cell-route type. They were shown on these specimens exactly as I demonstrated. It was never published in journal form but it appeared in the Transactions of the Chicago Pathological Society. Now as to the interpretation of these specimens we have nothing to go by, because Gruening's works have never been published as they should be. But the pathological interpretation should be made by a pathologist. We should know what kind of bony change we are dealing with. The technic employed is quite secondary to the real bony change that is present, and you will find that we are coming nearer to that, after which we will have more rational treatment and better reports on our mastoid work. Now as to

the blood clot, I have only used it in one case, and that was a case of furunculosis which I opened up and thought it was a mastoid. Of course it got perfectly well. But mastoids are not aseptic. How do you know what kind of bacteria are in that wound? I think I would rather have a little drainage and a few strands of silkworm gut. I think I would much rather have it open, especially in a radical mastoid.

DR. PARSONS (closing discussion):—I wish to make a disclaimer of any intention of intimating Dr. Kopetzky had not tried the blood-clot operation, because in conversation with him last night I learned that he had. But I say the ones who are most afraid of it are the ones who have not done it at all. As to my method I claim no originality for it and I wish to correct the impression that this is my method. I did not attempt in the paper to go into any details but to present what I am pleased to style a general argument in favor of the rationale of trying out this blood-clot method of handling these cases, based upon the fact that, with adequate technic in selected cases—no one, of course, would advise the use of the stunt of whittling off the canal over a cholesteatoma or closing up a brain abscess or anything of that kind—in a reasonable number you will get primary union. If you do not you will be better off than you were before, because you can convert it into an open wound and you will positively save time in the healing.

In regard to the point that has been suggested from the beautiful pathological descriptions of Dr. Kopetzky as to the danger of infecting a sinus that has been uncovered in using a blood clot: I admit my technic is inclined to be clumsy at times, but if I chip off a piece of bone from the sinus or expose a little dura I have never seen any trouble coming from the use of the blood clot in those cases. I think it is rational to argue that good fibrinous deposit is fully as good a protection to that area as a piece of gauze would be. Whether or not you agree that the blood clot is a desirable thing it seems to me that the trend of modern mastoid surgery is going in that direction. You do not pack these cases as tightly as you used to. You give Nature a chance to heal them up.

DR. E. J. BERNSTEIN, Kalamazoo, Mich. (closing discussion):—I have not attempted to classify or typify these cases for lack of time and space, and it is impossible to go into full detail. I am quite convinced that I have been very general in saying chronic mastoiditis. I am only reciting what the results have been in some of these conditions which are classed as chronic running ears. As to time, one of these cases has been well two years, one has been well one and a half years and several of them a year. As far as there being cholesteatomata, I confess I would rather be ashamed if I did not recognize a cholesteatoma. Some of these had it and they got well.

DR. S. J. KOPETZKY, New York (closing discussion):—The writer of the first paper makes a presumption contrary to fact when he states that the objectors to the use of the blood clot have not tried the method. I have faithfully given the method a trial. I have not succeeded with it. I have tried each technic as it has been described. I will do so again. With my present experience, I can only say that it did not succeed in my hands.

Regarding the blood clot in radical mastoid surgery, where no flap is made from the soft tissues of the auditory canal, I beg to say that this procedure defeats the objects sought after and indicated by a radical mastoid operation, namely, to throw the middle ear and mastoid excavation into one communicating cavity.

To me, the class of cases which the author subjected to his procedure is not clear. Chronic suppurative otitis media is no diagnosis. It is a generic term applied to many chronic conditions. We might have a better understanding of the results reported were more definite diagnoses made of the cases on which the blood clot was tried.

The same general criticism holds true of the diagnosis of Dr. Bernstein's cases in which he reports his cures by vaccine therapy. I fail to comprehend just what he was treating in his cases of chronically discharging ears by the vaccines. Was he curing bone necrosis, were cholesteatomata dissolved by vaccines, or were they cases of chronic suppurations of the tympanic mucosa? Until detailed diagnosis precedes the administration of vaccine therapy confusion will continue, and results reported by one observer will fail to be duplicated by others.

GAS-OXYGEN ANALGESIA IN EYE, EAR, NOSE AND THROAT SURGERY

WILL WALTER, M.D.

CHICAGO

In the beginning it is proper to disclaim all effort to discuss the subject of deep general anesthesia. That field belongs properly to the anesthetist.

Our theme relates to the means and the technic employed in the production of analgesia, a newer type of painless surgery, and particularly to what might be called the minor cases, though applicable to many cases hitherto thought to be of major type. These are as related to the cases requiring a special anesthetist in the proportion of about ten to one. They are the cases in office and bedside practice for which we ourselves should provide painless surgery, both with the idea of saving of time, of effort for ourselves and of expense for them; most of all, however, we aim to take from our patients the distress incident to minor surgery and that which accompanies more profound anesthesia in major work; also to eliminate the fear and shock elements.

Interest in gas-oxygen analgesia is at once aroused by personal experience. One who intends to use it in practice should first try it on himself. As consciousness or at least semi-consciousness is maintained, though pain sensation is dulled or annulled, self-experimentation is easy.

My first experience was a personal one, and my sensations were, I should say, subconsciously though not consciously painful. To use a paradox the operation hurt though I did not feel it.

To those who are unfamiliar with the subject, may we call to mind that analgesia differs from anesthesia in respect to this consciousness or semi-consciousness and the voluntary control which accompanies the former; in fact, I should say from experience that this condition is a borderline one since the patients are quite amenable to suggestion though they may be unable to answer questions.

Nitrous oxid alone, as you have many times seen, produces cyanosis with anesthesia, an undesirable state; a small amount of oxygen added, 2 or 3 per cent., will, however, prevent this cyanosis, though still allowing complete anesthesia. A further dilution of the gas with oxygen, will produce various stages of

analgesia and not anesthesia in the sense of complete loss of consciousness and voluntary control, and the ratio required for this analgesia varies from 10 to 33 per cent. or even 50 per cent. of oxygen, according to the degree of analgesia needed. This is governed of course by the varying susceptibility of the patients as in any form of anesthesia. Also a lower ratio of gas to oxygen will produce either analgesia or anesthesia when preliminary medication, as by morphin or scopolamin, is employed or when the patient is nervously quiet—mentally relaxed—and free from fear.

That successful gas-oxygen anesthesia depends upon the exclusion of air will be evident upon study. Nitrous oxid alone will produce anesthesia, but that anesthesia is, as we have noted, accompanied by cyanosis and may not safely be continued for any length of time, but with the addition of 2 or 3 per cent. oxygen the anesthesia is still perfect and may be continued indefinitely.

Now it will be seen that an admixture of air, which would give this 2 or 3 per cent. of oxygen, would dilute the volume of nitrous oxid to an extent lower than would produce anesthesia. Air contains twenty volumes of oxygen and approximately eighty volumes of nitrogen, therefore, to add 2 or 3 per cent. of oxygen in air would require an admixture of 8 to 12 per cent. of nitrogen and this would immediately reduce the ratio of oxygen to nitrous oxid. The greater the amount of air employed the less the available nitrous oxid.

In dentistry it is possible to employ any ratio of oxygen to nitrous oxid through the medium of a tight-fitting nose mask and to continue its administration for analgesia indefinitely, because the patient is able to obstruct his mouth breathing by means of the tongue without interference with operation upon the teeth. The application here simulates general gas-oxygen analgesia and is the same as for all operations with which we are concerned, with the exception of work beyond the wall voluntarily brought about by the apposition of the soft palate, the tongue and the anterior pillars. Therefore our problems are the same as other problems with reference to this type of anesthesia so long as air may be excluded from respiration. But for surgery of regions behind this wall we are obliged to produce an anesthesia and to work rapidly as soon as this wall is opened and air of necessity inhaled.

As to how we endeavor to meet this will be seen later, for while we may not produce anesthesia with the mouth open we

may produce a degree of analgesia if we throw into the mouth a stream of pure nitrous oxid sufficient to minimize the amount of air in the mixture, producing a fairly good proportion for the production of analgesia.

MASK MUST BE TIGHT

Bearing in mind, therefore, that if we wish to control analgesia we must exclude air, *the first requirement* of an apparatus for the administration of these gases will be at once apparent; namely, that the mask be tight. It has taken us something like two years to find a tight and universal mask adapted to this work and it is with a sense of pride that we show you this part of the apparatus. There are three sizes of this mask, the principle in all being the same, one for adults, one for children—both for the complete face—and one for the nose alone, this latter being adaptable to practically all cases. Each mask is made in a single piece of rubber with a feather edge. No adjustments are necessary; they simply fit themselves to any face.

APPARATUS MUST BE FREE FROM PRESSURE

The second requisite of the apparatus is that it should be free from dangerous pressure. We are dealing with a pressure of gases in gas and oxygen tanks from 1,500 to 800 pounds and the problem here is to reduce it to a safe and constant pressure and then to control it at that pressure and keep it within safe limits, so that there shall be no possibility of high pressure gases entering the lungs.

RATIOS OF GAS AND OXYGEN MUST BE CONTROLLED

The third problem is to have a definite measure of the ratio of oxygen added and this must be met not by any theoretical scheme of regulation, as by the amount that a valve is turned, but by some visible evidence of the rate of flow—an actual sight feed proposition.

GASES MUST BE WARMED, MOISTENED AND WASHED

The fourth problem presented relates to the washing, warming and humidity of the gases. I know that these things have not been thought of great importance, but if we are working for refinements they are necessary and certainly are a great aid in their application for the production of anesthesia and analgesia. Nitrous oxid is a desiccating gas and after prolonged use will

produce certain drying of the pulmonary tissues, hence the addition of humidity is of value. Both gases are occasionally impure, containing oxidizing products and flakes of rust and as we have no control over their delivery to us and as, in spite of the greatest precautions, these impurities are sometimes introduced, the washing of the gases by passing through water is of great advantage. As to the warming you will not have to be told that a warm gas is more absorbable and will go farther than a cold one and that hence their washing and warming and the addition of humidity to about 50 per cent. or more should have a prominent place in such an apparatus.

PATIENTS MUST COOPERATE

The fifth problem for analgesia is the enlistment of the aid of the patient. If we are to produce ideal analgesia there must be a willingness on the part of the patient to help. This they are very willing to do when the problems are explained to them and the great advantages of the method are shown. Suggestion and counsel and the quieting influence of the anesthetist are here most apparent just as in most methods of anesthesia. The patient needs to be assured repeatedly that everything is all right and to be told with firmness what to do. In analgesia they will hear you and will do what you say though they are not usually able to answer questions. It is this state which seems to offer so much help for us in daily routine.

Obviously in hospital service our patient is turned to us ready for operation and without any thought on our part as to the means employed. But the whole world wants to be free from pain in surgery and most of them want to hold to consciousness and dread the loss of it by being put under beyond the possibility of immediate recall. Incidentally laymen are in full knowledge these days of the annoying after effects and the dangerous shock sequelae of complete necrosis. Then there is the time element, the element of preparation necessary for ether narcosis and lastly the overcrowding of hospitals for minor work and the longer detention for these short cases because of the heavy anesthesia.

Any degree of analgesia up to complete anesthesia may be brought about with absolute safety and without previous starvation or preparation, in from two or eight minutes.

During the past two years this apparatus in various stages of evolution has been in daily use and has found application in the following cases with relief from the distressing pain usually accompanying them.

IN OFFICE PRACTICE

In Ophthalmology.—Opening of lid abscesses, operations upon cysts, styes and small tumors. Electrolysis, painful epilations, cauterization of ulcers. Removal of stitches, removal of deep foreign bodies. Passing of lacrymal probes, slitting of canthi, expression of trachoma bodies. Repairs of traumatisms. Sewing up of lacerations, and painful applications and examinations generally. It is available for most operations upon the lid and I once used it for Ziegler's cautery operation for entropion. All of these operations may be done in office practice and to the great relief of patients.

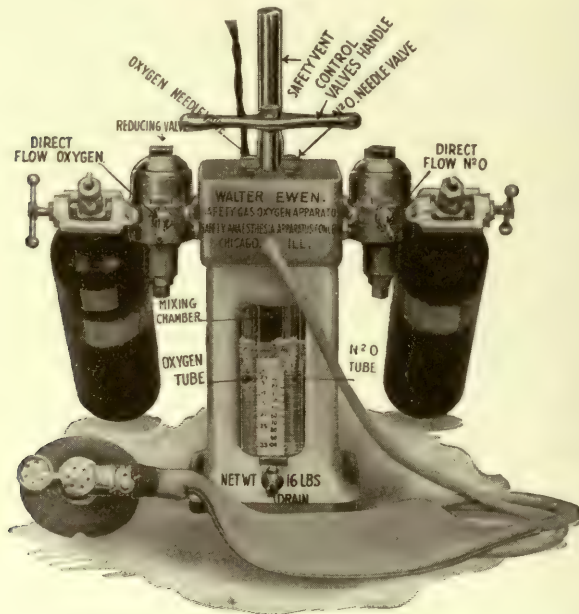


Fig. 1.—Complete apparatus.

In Rhinology.—Incision of furuncles. Opening and curetting of abscesses and of ethmoidal cells and any painful intra-nasal work; puncture and drainage of antra, removal of polyps, postturbinal hypertrophies, cauterizations, removal of stitches from frontal sinus operations and the passing of probes in these cases. All these operations are done using the mouthpiece and inhaler. Adenoidectomy and tonsillectomy have frequently been done in the office, employing this method. Peritonsillar abscesses are easily cared for and the patients' control over their expectoration is of great value.

In Otolology.—Incision of furuncles, painful probings, removal of stiches, removal of polyps, curettage of granulations, all painful dressings and applications and examinations. It is particularly valuable in paracentesis and for ossiculectomies. In first dressings after mastoid it is wonderfully comforting.

IN HOSPITAL WORK

It is available as a preliminary to general anesthesia, and complete anesthesia may be brought about as we have shown either by the gas oxygen alone or by the addition of ether, and in the latter case they slip into the general anesthesia quite unconsciously. They will usually recover before the dressings are applied even when relaxing portions of ether are added as they may be without removal of the mask.

Alone I have on two occasions filled the bag with gas-oxygen in proportion of 90 to 10, detached it from the apparatus, letting the patient control it, rebreathing the mixture and deepening the respirations at the critical moment and have been able to make otherwise unbearable short operations painless. Once we removed a tonsil by this means without assistance, the patient inhaling until she dropped the bag upon which I removed the tonsil and was making pressure upon the area when she came out.

Several times we have taken a bag full of the gas with 3 per cent. oxygen to the house of the patient as a preliminary for ether to be administered by the family physician. This practice would be easy also for a bedside paracentesis when it is inconvenient to take along the whole apparatus. This bag filled and put into the satchel may be easily carried and will instantly be available for use.

MUST EMPLOY REBREATHING

The sixth problem is that of rebreathing and as it is more than likely that many of the good effects of gas-oxygen anesthesia depend upon rebreathing, its solution is important. It is here met by putting the bag at the mask and by controlling absolutely and in a simple way the to and fro or partial or complete rebreathing as desired.

ETHER ADDED WITHOUT REMOVING MASK

In cases requiring anesthesia ether may be added without the removal of the mask and without stopping the flow of gas-oxygen. Full description of this technic is published elsewhere. *This constitutes the seventh problem* and relates more to anesthesia than to analgesia and hence is omitted from the discussion.

Incidentally, once the patient is under ether the ether is retained in the blood by means of rebreathing, since ether will be retained after the ether tension in the bag and in the blood are equal; thus less ether is needed to bring about narcosis. Then by finishing with gas oxygen, using to and fro breathing, the tension being lowered in the bag, ether is quickly eliminated and the postoperative elimination rendered unnecessary, ensuring quick recovery and freedom from after effects.

The means by which the above-mentioned problems have been met have been elsewhere described in detail, as well as the technic of application. The latter we will rehearse briefly.



Fig. 2.—Showing mouth inhaler, for nose or eye surgery. Ether cylinder not attached.

TECHNIC OF APPLICATION

The apparatus is made complete and there remains nothing to do but attach the gas tanks. When used away from hospital or office we order the tanks delivered direct from the dealer and have to carry only the apparatus in its case together with the mask and attachments.

The tanks are attached, after which warm water is poured in up to the marked water line. The hydrostatic safety valve is always open at the top and if water is poured through this opening it first fills the safety valve and then overflows into the mixing chamber.

For operations of twenty minutes duration or less we depend upon the water for the heating, but for longer cases we attach the plug of the heating coil to a convenient socket.

Both needle valves are now closed and the outflow valves on the tanks are fully opened, also the one-hand control valve. The pressure of gases is now at the needle valves and ready for the determination of its flow by opening of these valves. The nitrous oxid needle valve is first opened to the required flow and the level is noted, after which the oxygen needle valve is set at the desired percentage. The control valve is now closed and we are ready.

The proper mask is applied to the patient, mouthpiece if for nose operation, nose mask if for mouth operation and the whole face mask if for general work.

The control valve is now opened and the breathing bag allowed to fill with the mixture of gases. This is accomplished by closing the outlet valve of the mask. The outlet valve is then opened allowing to-and-fro breathing and the patient is directed to inhale and is allowed to until he fails to answer questions—he is in the analgesic state. If something painful is to be done he is told to breathe more deeply and will pass into anesthesia.

For rebreathing the control valve is turned off and the outlet valve closed; or both the control valves may be opened to give partial rebreathing and partial to-and-fro breathing, all according to the needs to be met.

When it is desired to add ether, the ether cylinder is slipped on and ether dropped into the cup as desired. The amounts of ether and gases and the degree of rebreathing are always under control of the anesthetist and without removal of the mask.

This is the technic for all analgesia where exclusion of air is possible, full masks being employed. For operations upon the eye or nose the mouthpiece is employed.

This carries only a mixing chamber with exhalation valve and bag attachment. The mouthpiece is held firmly by the teeth, the lips closed over it, the apparatus being off side and out of the way. Nasal breathing being excluded by plugging we have again the exclusion of air; a dentist's rubber dam applied accomplishes this for deeper degrees of analgesia or for anesthesia when control is lost.

For operations upon tonsil or post-tonsillar areas it becomes necessary to switch from the rebreathing mask to the free flow of gas.

The technic is as follows: the nosepiece is employed until anesthesia is well established. The apparatus being provided with direct flow under pressure from 12 pounds to a few ounces as desired, directly from the reducing valves, the gas tube is introduced into the mouth directly or through a tube carrying gag or by what is very good, a Foregger mouthpiece. The direct flow is instituted and sufficient gas is forced into the now open mouth to maintain analgesia.

The patient is able to expectorate blood if the tubes are employed rather than the gag, but it is necessary to start with gag in place since many patients shut the mouth tightly when passing into anesthesia and time is lost in forcing it open. It is difficult to voluntarily expel blood from the mouth with a gag in situ. Analgesia allows the patient to voluntarily expectorate and they will do so when bidden.



Fig. 3.—Showing nasal inhaler for mouth and throat surgery. Patient holding ether cylinder attached.

When employing analgesia we usually take one tonsil, allowing time for stemming hemorrhage on that side before doing the other, but it is sometimes easier to free both pillars under local anesthesia and then while in the analgesic state to do both excisions before they recover.¹

1. Our most successful routine in tonsillectomy is: *first*, preliminary hypodermic of morphin and atropin one hour before operation, dose according to age; surface anesthesia with cocain and adrenalin; three injections of 2 per cent. novocain and adrenalin on each side, one under the mucosa of the anterior and posterior pillars, the third in the capsule of the tonsil, the needle being introduced deeply above the tonsil. The patient is in the upright position and the tonsil is freed by sharp or blunt dissection as needed, the tonsil being held on the stretch. If the patient is nervous or hyperesthetic or is complaining we then do the same to the opposite tonsil, after which analgesia is given and both tonsils removed by snare. If the patient is not complaining gas is not used, operation being concluded upon the first side before the second is dissected. If the Sluder is done, both tonsils are taken with one analgesia if possible; more often one is taken out at a time, the second after bleeding in the first is checked.

For endolaryngeal work the continuous flow may be employed and as it is most important here to have warmed, washed and humid gases and low pressure, or we may temporarily stop off the safety valve and thus forcibly expel the gases from the bag in any quantity or by pass flow of the gas directly. The technic of Gwathmey-Woolsey is excellent for these cases.

For adenoidectomy a simple administration of gas oxygen is all sufficient, as the operation may be done before the patient comes out of the analgesia.

The thought is prevalent that little children cannot take gas oxygen because they have not sufficient respiratory power, but with this lower pressure apparatus and its safety attachment no trouble has been experienced. Often the child will struggle, but he will not afterward remember that he has been subjected to traumatism.

Recovery from analgesia is a matter of two or three minutes and no untoward effects have been observed.

122 South Michigan Avenue.

DISCUSSION

DR. J. M. INGERSOLL, Cleveland:—At Lakeside Hospital nearly all the surgical staff use gas anesthesia extensively. We have our own plant and the gas is piped to the operating rooms. In my own work we always begin with gas anesthesia. Where we are not working directly through the mouth, most of the operations are continued under gas anesthesia. We use gas as an analgesic in all the minor operations, such as incision in the drum membrane or opening furuncles in the auditory canal or nose.

For all operations where ether is to be used, gas is a desirable adjunct, for it shortens the period of anesthesia, decreases the element of shock and decreases the amount of ether which must be given. I would feel lost without it. We give oxygen at the end of the operation to hurry the recovery from the anesthetic.

I have had no experience in actually giving gas. We have our trained anesthetists and I depend absolutely upon them. In mastoid operation, if the blood gets a little dark, I call the anesthetist's attention to it and she gives a little less gas and a little more oxygen. Most of our anesthetists get part of their training in our dispensary during tonsillectomies.

In Lakeside we feel that the gas is the safest anesthetic we have, with skilled anesthetists. I emphasize the word "skilled." A well-trained, skilled anesthetist can give gas more safely than any other anesthetic. The element of risk with an untrained anesthetist is greater with gas than with ether. The margin of safety is wider with ether than with gas. I should hate very much to do a mastoid operation under gas unless I knew absolutely that my anesthetist was a skilled one. I have experimented a little in doing tonsillectomies with gas alone, but have not been satisfied with it. I think that a careful tonsil dissection requires muscular relaxation, and you cannot get relaxation with gas alone. We have an ether tube attached to our gas apparatus, and the tube is put into the mouth

NOTE.—The apparatus is distributed by The Safety Anesthesia Apparatus Concern, 1422 Bryan Place, Chicago.

when we begin the tonsillectomy. Children we start the same as an adult. We begin with gas anesthesia and then switch to the ether or continue with gas. We do not make any difference in regard to the age in the choice of an anesthetic.

DR. J. MAURER, Marion, Ind.:—We use gas in nearly all forms of operations, and I think those who do not use it have overlooked something that is satisfactory to both operator and patient. The doctor told us that it is dangerous in the hands of the inexperienced; so is any other anesthetic. In adults, who do not want to have cocain used, gas given under pressure with an automatic self-regulating machine, submerged tonsils can be dissected from pillars and removed without pain to the patient. In the removal of foreign bodies from the ear, opening of furuncles and the enucleation of an eyeball it is a pleasure to have your patient get up from the operating table within a few minutes without any nausea. Dr. Crile of Cleveland does all his operations under gas anesthesia.

DR. F. W. BRODERICK, Sterling, Ill.:—I have had some experience in the past seven years in the use of gas and gas-oxygen anesthesia and as an analgesic about four years. The presentation by Dr. Walter is especially interesting in bringing us the portable apparatus and one that can be manipulated by the patient. I have used gas almost exclusively for seven years, and have had experience with the McKesson apparatus and some home-made affairs, but to Dr. Walter in this way we owe a great deal. I have used gas and oxygen as an analgesic, and have done a good portion of the nasal operations, especially submucous resections with it. In the case of a very nervous woman it is always a hard problem. Gas can be given to an analgesic state and it relieves the terror of the patient. I am glad Dr. Ingersoll mentioned the importance of a trained anesthetist. So many times have I seen gas given by so-called experts where they get the patient into a state of anesthesia and then force the gas. A great many of the criticisms I have heard from men who have been prejudiced against gas have been due to that. The instrument maker is to blame for having produced a complicated apparatus and talking about percentages. The percentage of oxygen has nothing to do with it in an individual case. Every case is a law unto itself in giving gas in an analgesic state. One man will take pure nitrous oxid and another nearly pure oxygen.

DR. SAMUEL IGLAUER, Cincinnati:—I have had considerable experience with gas and ether, and ten years ago presented a paper on that subject and devised an inhaler for the use of gas and ether. The gas bag is attached directly to the ether cone as in the apparatus of Dr. Walter. I think this is an important field for our specialty. The dentists and obstetricians have shown us the way here. Gas oxygen will probably supersede twilight sleep. While complicated apparatus is valuable for prolonged administration, for ordinary office work you do not need anything but a cylinder of gas, a yoke, a piece of rubber tubing, a bag and a face mask. You do not require a trained anesthetist to give gas for a minute or two. The dentist extracts teeth in a minute and a half, and does not need more than the apparatus I have described. There is no doubt that gas is the safest anesthetic we have. Compared with ethyl chlorid there is no choice whatever. Since gas is so much safer it should be used in preference for brief but painful operations, such as incising the drum-head, opening abscesses, changing dressings and the like. For prolonged operations oxygen must be added, as described by the essayist.

DR. BISSELL, Rochester, N. Y.:—Regarding the safety in the use of gas, I would like to know the writer's opinion as to the safety of using it in the office by a trained nurse in advancement of the ocular muscles on a child.

DR. JOHN DONOVAN, Butte, Mont.;—A few years ago a professional anesthetist, Dr. J. B. Freund of Butte, returned from the East with a most modern gas apparatus. He was able to maintain analgesia but the expense was prohibitive. Anesthesia could only be obtained by the addition of ether. Our altitude being over 5,700 feet I understand our people have an excess of about 20 per cent. hemoglobin. The oxygen immediately combines with this loosely combined excessive hemoglobin so that the patient is very much awake before the gas begins to operate.

DR. BURT R. SHURLEY, Detroit;—Dr. Walter is to be congratulated on the refinement of the method he has given us in analgesia with nitrous oxid. I have made use of gas by means of the various instruments brought out from time to time. Through the early stage, where a great deal of minor work was done under gas anesthesia, we opened a number of peritonsillar abscesses by this method at the house or hospital or office. I met with a tragic experience some years ago. Gas was administered by one of our internes, a well-trained man, while I opened a peritonsillar abscess in the throat of a colleague and dear friend. At the moment the knife was inserted the patient stopped breathing and turned black, and it was only after the most heroic measures that the patient was brought back to life. A tragic experience of that kind wrecks one's enthusiasm, and I have joined the ranks of those who are exceedingly wary in the use of gas. I find it requires skill, refinement and education of a specialist who devotes all his time to that sort of work if I am to have every confidence in the anesthetic at work. Since then I use gas with my expert office assistant only in a paracentesis of the ear, and leave it out for throat work. Ether is the best for the rank and file of the profession.

DR. J. C. BECK, Chicago;—I have had no sad experience with gas, but my experience has been limited and it has been a good many years since I tried gas. I believe I was the first in Chicago to use gas to operate a case of sinus thrombosis and to use gas for complete and long-continued anesthesia. I gave it up for a reason not stated here. It costs too much.

The American Medical Association has a committee on anesthetics that says gas is an unsafe anesthetic except in the hands of experts. Analgesia, the subject for discussion, is a very excellent thing as brought out by Dr. Walter. Analgesia is the thing we are to talk about. To take away the mind of the patient before he gets the choking effect of the ether, we start him on gas and gradually float him in to the ether. By finishing the operation under gas, he is out of the anesthetic when ready to be put to bed. Then it is to be used in case there is a contraindication for the use of ether, but ether is the safest anesthetic. I can see no reason why one needs an expert for the use of a few whiffs of gas. It is the long-continued use of gas that is dangerous.

DR. WILL WALTER (closing discussion);—It was with the idea of eliminating many of the points of danger which have been raised in the discussion that we have worked out this apparatus. It is not entirely mine. We had to have an expert to get rid of the bad effects of pressure, and I am indebted to my friend, Mr. M. F. Ewen, an engineer specializing on gas pressure, for valuable aid.

In this apparatus you have pressure limited to a maximum of 6 ounces by a simple hydrostatic device—a column of water. By adding to the height of the column you may add to the pressure allowed.

As to the safety of gas, Dr. Hasbrook, a dentist in New York, has given it in over 200,000 cases for extraction of teeth without a casualty. His patients are blue, and even that is safe for a minute or two—not longer. By adding definite percentages of oxygen, prolonged administration is made safe.

The object of going to the trouble to perfect such an apparatus was to reduce the expense of administration; to simplify the apparatus, make it light and portable and make it safe.

It is the most economical apparatus I know. There are simply two small tubes in water carrying gas. We reduce all elements of pressure and the element of expense is cut down.

I had no intention of discussing full anesthesia. I have not had experience in prolonged administration myself. When employed it is by a professional.

One point I would like to dwell upon is the value of the rebreathing mask at the face, and this both for economy and safety. Three feet away it is not valuable.

When ether is added to gas give your ether in small quantities. Then if you shut off the inhalation valve and thus stop direct ether the patient may rebreathe three or four minutes, for the ether is retained in the blood so long as the tension of the blood and the bag are the same. You can control it to any degree you desire.*

Dr. Beck speaks of finishing with gas oxygen. Now, we finish with the gas oxygen for a definite reason, and that is not simply to ease off the patient. As we have said, ether is retained in the blood so long as the tension is as great in the bag as it is in the blood. When you change to gas, the ether tension in the bag is reduced and the elimination of ether takes place. By finishing with gas oxygen, therefore, you not only maintain the anesthesia but slowly eliminate the previously absorbed ether. Thus the patient comes out of the anesthesia with less ether in the blood.

The giving of full ether for tonsillectomy is in favor of the operator entirely. We should consider their postoperative condition.

Some of you do part of your tonsillectomies under local anesthesia. The great value of analgesia added to local anesthesia is that if in any case you get to a point where you need some general dulling you have under analgesia two or three minutes for the purpose and the patient is still conscious. When the patient gets restless or nervous then, or is having pain, you have them breathe deeply and finish the work.

In analgesia there is not the danger which exists in anesthesia. A great many dentists are using it all over the city, and many times a day, without thought of evil effect.

The patient simply holds this nose mask over the nose and breathes, in depth according to requirements. They will afterward tell you they felt it but that it did not hurt.

* A word about Dr. Shurley's case: Full anesthesia being brought about by gas would seem to me to be the cause of his trouble. The great advantage of analgesia is that the patient is sufficiently conscious that they do not choke, and it is just this we are endeavoring to meet, by the analgetic mixture of gas and oxygen. I do not believe that such an accident would happen with analgesia.

THE BACILLUS OF PEREZ AS AN ETIOLOGICAL FACTOR IN OZENA

WILLIAM R. MURRAY, PH.B., M.D.

AND

W. P. LARSON, M.D.

MINNEAPOLIS

Rhinologists and experimental pathologists have concerned themselves for many years with the problem relating to the etiology of ozena. An extensive literature has appeared dealing with this condition without having given us any satisfactory explanation as to the etiology and pathogenesis of this form of chronic atrophic rhinitis. During recent years the theories which have gained greatest favor are those ascribing a specific infective agent as the etiological factor. It is not within the scope of the present paper to give a critical review of the different theories that have been advanced to explain the cause of ozena, and the authors have confined themselves to a bacteriological and clinical study of an organism isolated by Perez and claimed by him to be the cause of ozena.

In 1899 Perez¹ isolated and described an organism which he termed the *Coccobacillus foetidus ozaenae*, and which he believed to be the cause of ozena. He described his organism as a small, nonmotile coccobacillus somewhat polymorphic in character, stains by ordinary analin dyes and is gram-negative. It is non-liquefier; does not coagulate milk, which is usually rendered alkaline; causes urine to undergo ammoniacal changes; on potato an abundant moist, yellowish growth develops, without bubbles of gas. The cultures of the coccobacillus give rise to a characteristic fetid odor, which is influenced to a large extent by the nature of the culture medium. Perez also claims that this coccobacillus exists normally in the nasal passages of dogs, increases greatly during attacks of distemper and that the dog is capable of spreading the disease.

These findings of Perez received but little attention until he again brought them before the profession at the meeting of the Berlin Laryngological Society in 1913, and also submitted his results to the Institute of Sero-Therapeutics in Vienna, where

1. Perez: *Annals de l'inst., Pasteur*, 1899, p. 937. *Berlin klin. Wchnschr.*, 1913, No. 52.

his findings were confirmed by Hofer, and it is the published reports by Hofer that have again stimulated our interest in the etiology of ozena. Hofer,² in investigating the findings of Perez, gives his method of isolating the *Bacillus ozaenae foetidus*, confirms the claims of Perez, and believes the bacillus of Perez to be the true cause of ozena. Hofer and Kofler³ used a vaccine, prepared from Perez' organism, in the treatment of ozena cases, and report improvement in crust formation, fetor, pharyngitis sicca and general subjective improvement in seven out of ten cases.

During the summer of 1914, one of the writers secured from Dr. Hofer, in Vienna, two cultures of the Perez bacillus which may be regarded as authentic. These cultures were used in both our bacteriological and clinical experiments and the technic was carried out as described by Hofer.

In order to obtain some data as to the frequency of ozena, the authors examined clinically 775 institutional patients, aged 8 to 40, cases which were not admitted on account of any nasal affection, and found that out of 775 cases examined there were twenty-two cases of ozena (2.8 per cent.); 512 of the cases were females and 263 were males. There were twenty cases of ozena among the females, or 3.9 per cent., and two cases of ozena among the males, or 0.76 per cent. Five hundred of the above cases examined were inmates of the School for Feeble-Minded at Faribault, Minn.

EXPERIMENTAL

In our laboratory studies of the Perez bacillus we have followed the technic recommended by Hofer in an attempt to confirm his work. In our first experiments a series of eleven rabbits were injected intravenously with graduated doses of twenty-four-hour broth cultures of the strains brought from Vienna. These animals were kept under daily observation, but none of them presented the nasal discharge described by Perez and Hofer. In fact, the animals were not inconvenienced in any way by the inoculation. They were killed and autopsied in periods varying from seven days to three months following inoculation. In no instance could we find any changes whatever in the turbinate bones.

Assuming the cultures to be of low virulence, we set about to augment this character by means of animal passage. To this end

2. Hofer: Berlin klin. Wechnschr., 1913, No. 52, p. 2413.

3. Hofer and Kofler: Wien. klin. Wechnschr., 1913, No. 42, p. 1698. Wien. klin. Wechnschr., xxvi, 1011.

seven young rabbits (12 days old) were injected intravenously with twenty-four-hour broth cultures of the Vienna strains. Four of these animals died: one on the third day, one on the fourth and two on the fifth day following inoculation. Upon autopsy two of the animals presented some degree of congestion of the nasal mucosa; very little secretion was present. The bacillus was recovered from the heart's blood and the nasal cavities in the two cases and from the heart's blood alone in a third case. The organism which was recovered from the animals was far more pathogenic for rabbits than the original cultures, as evidenced by the following experiment: A series of nine rabbits were injected intravenously with 1 c.c. of a twenty-four-hour broth culture of these more virulent bacilli. Of these, five succumbed to the infection within the first four days. At autopsy, cultures were taken from the heart's blood and nasal cavities of all the animals. In two of the rabbits we recovered an organism, corresponding to the one with which the animals had been injected, from the heart's blood and nasal cavities. In the remaining three the cultures were negative.

Cultures were made from the nasal cavities of the animals which survived the inoculation, but in no case were we successful in recovering the Perez bacillus. All the inoculated animals which survived were later killed at intervals of from one to twelve weeks and examined. In no case was there any evidence of pathologic changes in the turbinates. Cultures taken from the turbinates were negative so far as the Perez bacillus was concerned.

Perez and Hofer have called attention to the difficulty of isolating their bacillus directly from the nasal crusts of ozena patients. In his paper Hofer leads us to infer that he has cultivated the organism directly from the crusts, but does not definitely say so. In fact, he makes the frank admission that in a series of cases examined, his cultural experiments met with failure in every instance. He therefore found it necessary to resort to animal inoculation. His procedure was as follows: The crusts to be examined bacteriologically were placed in sterile broth and incubated for twelve hours. Those cultures which then emitted a fetid odor were injected into the ear vein of rabbits. The animals thus treated either died or presented a discharge within a few days following inoculation. From the nasal discharge Hofer isolated the bacillus in 57 per cent. of his cases.

The authors have had opportunity to make a bacteriological examination of thirty cases of ozena. Crusts taken from the

patients were brought to the laboratory in sterile tubes and immediately planted in broth and upon agar plates. In some cases serum agar was used. Cultures were incubated and daily examination made so long as new colonies appeared, but we were unable to isolate any organisms which could be identified as the Perez bacillus. Thus, we have been able to confirm one phase of Hofer's work.

We also made use of animals in our attempt to isolate the organism. In this we followed the technic recommended by Hofer with great care. Twelve-hour broth cultures from crusts of twenty-four ozena patients were injected into the marginal ear vein of as many rabbits and the latter kept under careful observation. Fifteen of the animals died between the first and fifth days following. The animals were all autopsied. No nasal discharges were present in any of them. Cultures were made from the heart's blood and nasal cavities of all the animals. The organisms recovered, in order of frequency, were as follows: Streptococcus, staphylococcus, *B. mucosus*, *B. pyocyaneus*, *B. coli*, *B. proteus*; nothing suggestive of the Perez bacillus was found. The remaining nine rabbits of this series were kept under observation for some weeks, but never presented any nasal discharge.

Hofer has shown that the blood serum of an animal injected with the Perez bacillus acquires the property of agglutinating the latter in relatively high dilution, 1:1,000, or even higher. If the Perez bacillus bears the relation to ozena that he claims, one would expect the blood serum of infected patients to agglutinate the organism. We have made agglutination tests with the blood serum from thirty-four of our cases. In these tests both of the Vienna strains were used. Dilutions of 1:100 of the sera were made in all cases and in the most advanced cases dilutions of 1:50 as well. We were not able to obtain a frank agglutination reaction in a single instance.

Our serological experiments were carried one step further. Antigen was prepared from the above cultures for the complement-fixation reaction and standardized against serum obtained from an immunized rabbit. Only six specimens of blood were examined by this method but these were as entirely negative as our agglutination tests.

From our work it will thus be seen that we have not been able to obtain any experimental evidence in support of the contention of Perez and Hofer that their organism is the specific agent of this form of chronic atrophic rhinitis. We are inclined

to believe that the work of Perez and Hofer has failed to bring forth any convincing evidence that the organism in question has any relation to the primary cause of ozena. Hofer apparently is not sure that he has ever isolated the organism directly from his patients. The organism he calls the Perez bacillus apparently was isolated from the nasal cavities of a rabbit which had been inoculated with cultures taken from the nose of an ozena patient. Assuming this culture to be the Perez bacillus, Hofer proceeded to immunize a rabbit in order to obtain a specific agglutinating serum. All cultures which were subsequently isolated from the nose of rabbits and agglutinated by the serum prepared against his first culture he considered as Perez bacilli.

CLINICAL STUDY

The material used by the writers in carrying out the vaccine treatment was obtained from the clinic and private practice of one of the authors, and consisted of selected cases which presented the characteristic signs of ozena and which were kept under treatment and observation a sufficient length of time to enable the authors to draw definite conclusions as to the results obtained. Twenty cases were treated with Perez vaccines. Of these cases, twelve were under treatment for periods of from three to eight months and are herewith reported. Vaccines prepared from Perez cultures were administered in doses from 50,000,000 to 500,000,000, at intervals of seven days. No other treatment was carried out, either local or general.

CASE 1.—L. N. F., male, aged 27. Diagnosis, ozena. Onset at age of 12. No nasal symptoms at birth or following until age of 12. Whooping cough at age of 12. Wassermann, negative. Tuberculosis, negative. No history of similar nasal affection in family. No history of contact with dogs or other animals. Large greenish crusts present in middle meati. Inferior turbinates, advanced atrophy, right and left. Middle turbinates, moderately hypertrophied. Nasal mucous membrane dry, and atrophic. Fetor present. Sense of smell impaired. Sinuses, ethmoiditis. External nose, no changes. Atrophic pharyngitis. Does not complain of discomfort in pharynx. Tonsils moderately hypertrophied. Larynx and trachea: No objective changes; occasionally has acute laryngitis. Treatment: Perez vaccines, 50,000,000 to 500,000,000 at intervals of seven days. Reaction: Considerable local reaction in arm following second injection (100,000,000); swelling and soreness in arm lasted twenty-four hours. Result: No improvement during treatment. Odor present but not pronounced. No change in pharynx.

CASE 2.—M. O., female, aged 16. Diagnosis, ozena. Onset at age of 10. No nasal symptoms at birth. Measles and chicken-

pox during childhood. Wassermann, negative. Tuberculosis, negative. No history of similar affection in family. No history of contact with dogs. Large greenish crusts present in middle meati and extending into inferior meati. Inferior turbinates, very advanced atrophy, right and left. Middle turbinates, atrophied. Nasal mucous membrane dry and atrophied. Fetor present and very pronounced. Sense of smell, impaired. Sinuses, anterior ethmoiditis. External nose, broad. Atrophic pharyngitis. Pharynx feels dry. Hypertrophied tonsils and adenoids. Larynx and trachea: No objective changes; occasional attacks of acute laryngitis. Treatment: Perez vaccines, 50,000,000 to 400,000,000. Reaction: Slight local reaction at site of injection following third treatment. Result: Fetid odor diminished and disappeared after fifth injection (250,000,000). Lessened crust formation; crusts becoming much smaller in size and easily expelled. Mucous membrane more hyperemic. Discomfort in pharynx disappeared. This patient was compelled to leave the city after dosage of 400,000,000 and is reported because she showed the most marked improvement of all cases treated.

CASE 3.—D. M., male, aged 42. Diagnosis, atrophic rhinitis (bilateral). Onset at age of 20. No history of prior nasal involvement. Measles and pneumonia during childhood. Has had rheumatism. Wassermann, negative. Tuberculosis, negative. No history of similar affection in family. No history of contact with animals. Small crusts present in middle meati, right and left. Very advanced bilateral atrophy of inferior turbinates and moderate atrophy of middle turbinates. Mucous membrane atrophic. Nasal passages very large. Fetor not pronounced. Sense of smell impaired. Marked atrophic pharyngitis. Pharynx feels dry. Faucial tonsils moderately hypertrophied. Has had occasional attacks of acute laryngitis. Treatment: Perez vaccines, 50,000,000 to 500,000,000. Reaction: Increased discharge and headache followed second injection. Result: No objective changes in crust formation; no improvement in pharyngitis; slight odor present.

CASE 4.—C. M., male, aged 15. Diagnosis, ozena. Onset at age of 12. No history of nasal involvement immediately after birth, history of nasal obstruction since age of 6 or 7 years. Scarlet fever at age of 8 years. No history of similar nasal affection in other members of family. No contact with dogs or other animals. Wassermann, negative. Had tuberculous cervical glands removed at age of 10 years. No pulmonary tuberculosis. Moderately large crusts present in right and left nostrils. Inferior turbinates, atrophied. Slight ozena fetor present in crusts but not very pronounced. Sense of smell not impaired. Atrophic pharyngitis. Pharynx dry. Hypertrophied tonsils and adenoids. External nose, broad. Larynx, normal. Treatment: Perez vaccines 50,000,000 to 500,000,000. Reaction: None. Result: No change in nasal condition. Slight fetor present. No change in pharynx.

CASE 5.—M. K., female, aged 13. Diagnosis, ozena. Onset at age of 5. No nasal symptoms immediately after birth or previous to age of 5 years. Measles and whooping cough at age of 6 or 7 years. Father had similar nasal affection. History of contact with dogs from age 5 to 7. Wassermann, negative. Tuberculosis, negative. Very large greenish crusts present, right and left nostrils. Inferior turbinates, advanced bilateral atrophy. Middle turbinates, atrophic. Mucous membrane, dry and atrophic. Fetor present. Sense of smell, good. External nose, normal. Atrophic pharyngitis. Adenoids and moderately hypertrophied tonsils. Has occasional attacks of acute laryngitis. Sinuses, ethmoiditis. Treatment: Perez vaccines 50,000,000 to 500,000,000. Reaction: Slight local reaction at site of injection after third and fifth treatment. Result: Crusts present; no objective changes; patient says crusts are more easily expelled. Odorless. No discomfort in pharynx. Mucous membrane not as dry as formerly.

CASE 6.—Female, aged 23. Diagnosis, atrophic rhinitis (bilateral). Onset at aged of 12. No nasal symptoms immediately following birth. Measles during childhood. No history of similar nasal affection in family. Dogs kept in family before beginning of nasal affection and at onset. Wassermann, negative. Large crusts present in right and left nostrils. Septum moderately deviated to left. Inferior turbinates atrophied, right and left. Middle turbinates, right enlarged, left normal size. Fetor pronounced for number of years, not noticeable at present. Sense of smell unimpaired. Atrophic nasopharyngitis. Sinuses, ethmoiditis and sphenoiditis. Treatment: Perez vaccines 50,000,000 to 500,000,000. Reaction: Increase in nasal discharge following second and third injections. Headache following last injection. No rise in temperature. Result: No improvement, subjectively or objectively, until after sixth injection (300,000,000). Following sixth treatment, patient reported improvement in condition of pharynx and crusts more easily expelled. Final result: Crusts present. Atrophic pharyngitis shows improvement.

CASE 7.—N. H., male, aged 49. Diagnosis, atrophic rhinitis (bilateral). Onset at age of 20. No chronic nasal affection prior to onset of present nasal involvement. Measles at 6, scarlet fever at 7. No history of similar nasal affection in family. No history of contact with dogs. Wassermann negative. Tuberculosis negative. Very large greenish crusts present in right and left nostrils. Inferior and middle turbinates, right and left, atrophied. Nasal passages large. Mucous membrane atrophied. Septum moderately deviated, with small spur present. Fetor has been very pronounced until few years ago. At present fetor slight. Sense of smell fairly good. External nose normal. Atrophic pharyngitis; pharynx dry and uncomfortable. Larynx, no objective changes; formerly had frequent attacks of acute laryngitis. Sinuses, ethmoiditis and sphenoiditis. Treatment: Perez vaccines 50,000,000 to 500,000,000. Reaction: No reaction in nostrils. Following third injection there was considerable

pain and discomfort in arm, extending to elbow and shoulder; swelling at site of injection; duration twenty-four hours. Result: Crusts present; apparently no change. Pharynx does not appear as dry and glazed and patient insists there is less discomfort in nostrils and pharynx. Slight odor present on crusts.

CASE 8.—H. M., female, aged 14. Diagnosis, ozena. Onset at age of 6. No nasal symptoms present immediately after birth. Mumps, measles and rheumatism between ages of 6 and 12. One sister had similar nasal affection. No history of contact with dogs. Wassermann negative. Tuberculosis negative. Moderately large greenish crusts present in right and left. Inferior turbinates atrophied. Middle turbinates, moderate hypertrophy. Mucous membrane of nostrils dry and atrophic except on middle turbinate. Fetor present but not very pronounced. Sense of smell impaired. External nose normal. Atrophic pharyngitis, but does not complain of much discomfort in pharynx. Faucial and pharyngeal tonsils moderately hypertrophied. Larynx, no objective changes. Sinuses, ethmoiditis. Treatment: Perez vaccines, 50,000,000 to 500,000,000. Reaction: Slight local reaction in arm after second injection. Following third injection, patient complained of headache and increased nasal discharge. Result: Patient says she cannot notice any improvement. Crusts are present. No odor present.

CASE 9.—O. F., male, aged 11. Diagnosis, ozena. Onset at age of 7. No history of any nasal symptoms appearing immediately after birth. Measles at age of 6; whooping cough at age of 8. No history of contact with dogs. Wassermann negative. Tuberculosis negative. Crusts present in right and left nostrils, and mucopurulent discharge on middle turbinates. Inferior turbinates atrophied. Middle turbinates not atrophied. Mucous membrane of middle turbinates edematous. Fetor present. Sense of smell not impaired. External nose broad. Follicular pharyngitis. Moderately hypertrophied faucial and pharyngeal tonsils. Larynx not involved. Sinuses, ethmoiditis. Treatment: Perez vaccines 50,000,000 to 500,000,000. Reaction: None. Results: No improvement.

CASE 10.—A. P., female, aged 22. Diagnosis, ozena. Onset at age of 6. No nasal symptoms immediately after birth. Mumps at age of 12. Mother and one brother had similar nasal affection. Patient came in contact with dogs, cattle and horses during childhood (at onset of nasal affection). Wassermann negative. Tuberculosis negative. Very large greenish tubular crusts present in right and left nostrils. Inferior turbinates, advanced atrophy. Middle turbinates, moderately atrophied, covered with crusts and mucopurulent discharge. Nasal passages large. Mucous membrane atrophic. Fetor very pronounced. Sense of smell much impaired. External nose broad and moderately sunken. Atrophic pharyngitis; discomfort in pharynx. Moderately hypertrophied faucial and pharyngeal tonsils. Larynx, recurring attacks of acute laryngitis. No crusts present in larynx and no atrophy present. Sinuses, ethmoiditis and sphenoiditis. Treatment:

Perez vaccines 50,000,000 to 500,000,000. Reaction: Moderate swelling and redness at site of injection following first treatment. Results: No clinical improvement. Crusts present. Patient says no subjective improvement. Odor present.

CASE 11.—A. H., male, aged 32. Diagnosis, ozena. Onset at age of 17. No nasal affection immediately following birth. Measles during childhood, typhoid fever at age of 20. No history of similar nasal affection in family. No history of contact with dogs. Wassermann negative. Tuberculosis negative. Very large greenish tubular crusts in right and left nostrils. Inferior turbinates, advanced atrophy. Middle turbinates not atrophic; covered with large crusts. Nasal mucous membrane dry and atrophic below middle turbinates. Fetor present and pronounced. Sense of smell impaired. External nose normal. Atrophic pharyngitis; does not complain of much discomfort in pharynx. Larynx and trachea normal. Sinuses, ethmoiditis and sphenoiditis. Treatment: Perez vaccines 50,000,000 to 500,000,000. Reaction: None. Results: Odor present. No objective signs of improvement; large crusts present. Patient says nasal crusts more easily expelled.

CASE 12.—C. L., female, aged 23. Diagnosis, ozena. Onset at age of 19. No nasal affection immediately after birth. Measles and scarlet fever during childhood. No history of similar nasal affection in family. No history of contact with dogs or other animals. Wassermann negative. Tuberculosis negative. Moderate crusting in right and left nostrils. Septum moderately deviated to left. Inferior turbinates atrophied, right more so than left. Middle turbinates not atrophied. Fetor present. Sense of smell not impaired. External nose normal. Follicular pharyngitis. Sinuses, ethmoiditis. Treatment: Perez vaccines 50,000,000 to 500,000,000. Reaction: None. Results: Lessened crust formation. Small thin crusts present after last injection. No odor.

SUMMARY (EXPERIMENTAL)

In our experimental work, twenty-seven rabbits were injected with cultures of Perez bacilli received from Hofer. We were unable to confirm the work of Perez and Hofer in which they state that their bacillus shows selected affinity for the nasal mucosa. We did succeed in isolating the organism from the nasal passages of four rabbits, but it must be emphasized that we never succeeded in isolating the organism from the nose save in those cases in which it was also present in the heart's blood. In none of the twenty-seven animals used in our experiments was there any evidence of atrophy of the turbinate bodies. Twenty-four ozena patients were examined bacteriologically, according to the method recommended by the Vienna author; all gave negative results. Agglutination tests were made from the blood of thirty-four ozena patients, but no frank aggluti-

nation reactions were recorded. The complement-fixation reactions were likewise negative in the six cases examined.

CLINICAL

Age of onset: 12 (3), 10, 20, 5, 29, 6, 2, 17, 19. Constitutional diseases: Wassermann negative in all cases. Evidence of tuberculosis absent in eleven out of twelve cases. Inferior turbinates: Atrophy in all cases. Middle turbinates: Some degree of atrophy in five cases. Hypertrophy in four cases. Normal size in three cases. Fetor: Present and distinct in nine cases; slight fetor in two cases; absent in one case. Sense of smell: Impaired in six cases; not impaired in six. External nose: Broad in four cases; normal in eight cases. Pharynx: Atrophic pharyngitis in ten cases. Follicular pharyngitis in two cases. Similar nasal affection in family: In Case 5 father had atrophic rhinitis; in Case 8 one sister had atrophic rhinitis; in Case 10 mother and brother had atrophic rhinitis. In seven of the cases there was no family history of similar nasal condition. Contact with animals: Cases 5, 6 and 10 give a history of having come in contact with dogs prior to and at onset of nasal affection. Reaction following injection of vaccines: Some local reaction, at site of injection, occurred in Cases 1, 2, 5, 7, 8 and 10. Increased nasal discharge followed injection in Cases 3, 6 and 8. Headache and slight malaise followed injection in Cases 3, 6 and 8. Results: Some degree of improvement, subjectively or objectively, in Cases 2, 5, 6, 7, 8, and 12. No improvement in Cases 1, 3, 4, 9, 10 and 11. Crust formation: There was objective improvement in size and quantity of crusts in Cases 2 and 12. No change in crust formation could be noted by examiner in Cases 1, 3, 4, 5, 6, 7, 8, 9, 10 and 11. In Case 2 there was a very noticeable improvement in crust formation, the crusts becoming much smaller in size and loosely attached. Case 12 showed some improvement in size of crusts but not in disappearance of crusting. Fetor: There was a disappearance of fetor in Cases 2 and 12. Improvement in Cases 5 and 8. No improvement in Cases 1, 3, 4, 7, 9, 10 and 11. In Case 6 there was no fetor present at beginning of treatment. Pharyngitis sicca: Pharyngitis sicca was present in Cases 1, 2, 3, 4, 5, 6, 7, 8, 10 and 11. Follicular pharyngitis in Cases 9 and 12. Of the ten cases of atrophic pharyngitis, dryness and discomfort was complained of in Cases 2, 3, 4, 5, 6, 7 and 10. Subjective improvement followed treatment in Cases 2, 5, 6 and 7. No improvement in Cases 3, 4 and 10.

CONCLUSIONS

Experimentally, our work has been rather disappointing, not having been able to obtain any evidence that the bacillus as described by Perez is the cause of ozena, and we are unable to confirm the experimental work of Hofer.

Clinically, improvement was obtained subjectively and objectively, in a proportion of the cases reported. There was undoubted objective improvement in crust formation in two cases. There was a subjective improvement in fetor and pharyngitis sicca in a larger proportion of cases. A sufficient length of time has not elapsed since cessation of treatment to enable us to state that the improvement obtained is permanent, and it cannot be considered that a cure was affected in any case. While clinical results have been encouraging in some of our cases, we do not believe that our clinical evidence is sufficient to warrant the belief that the *Perez bacillus* is the true cause of ozena, and a review of the literature, with a comparison of our clinical results, will show that equally good results have been obtained by other investigators who have used other forms of vaccine in the treatment of ozena.

The authors wish to acknowledge their indebtedness to Dr. A. C. Rogers and his associates, Drs. Trowbridge, Finkle and Barnard, of Faribault, for courtesies extended to them.

DISCUSSION

DR. A. A. HAYDEN, Chicago:—The last paper is in accordance with what Dr. George Dick and myself have been doing at the St. Joseph's Hospital for the past year. I was to have presented this paper to the American Medical Association meeting at San Francisco, but an operation on myself prevented my going. In regard to the frequency of occurrence of ozena, if we read the literature we are inclined to believe that it is a frequent if not a common disease. The essayist in his statistics shows very clearly that in this country at least this is not true. Of 2,000 cases seen in the past year, about one half of which were children ranging in age from 6 to 16, only one case of ozena was found. In the dispensary and private practice five cases were collected, this making six cases in all, so that the disease is very uncommon at least in my experience. The crusts were taken from the nose and placed in sterile containers or some of the secretion underneath the crust was placed on a blood and agar slant. In none of these cultures was the *Perez bacillus* isolated, but we found constantly a species of the Friedlander organism and a diphtheroid bacillus together with several other organisms that were inconstant. From these cultures autogenous vaccines were made and injected into these patients at intervals of seven days in very small doses, very much smaller than Dr. Murray has stated. The results have been quite gratifying in four of these cases. The crusting and odor has entirely disappeared and the patients are very much better physically. An acute coryza will, however, invariably cause the crusting to return for a few days. In none of these cases was there a family history of

ozena. Neither has any of them presented a history of having come into contact with a case of distemper in a dog. The results have not been entirely satisfactory, but it seems to me that the ultimate solution of the ozena problem, which is a very important problem to the patient having the ozena, practically excluding him from the schoolroom, or close social intercourse with other people, the ultimate solution, I think, lies in vaccine therapy.

DR. HARRY POLLOCK, Chicago:—Three years ago before this society I presented a paper on the etiology of ozena, at that time as a preliminary report. The number of cases which I had and have had since is far in excess of the reports which the two previous speakers have given. I presume in our private practice we get about twenty-five cases a year at least. In those cases about 90 or 95 per cent. are in females. In all cases I have made a thorough bacteriological examination and have not been able to isolate the Perez bacillus in a single case. The cultures we have obtained are more in harmony with the one which Dr. Murray has presented. We have made autogenous vaccines and have found very little results. I think all of these bacteria and the bacillus of Perez are saprophytes. In my paper I presented a ductless gland theory as to the etiology of ozena and I still think my views are correct. In ozena cases we have a lack of harmony of the ductless glands. Most of these cases are in young girls about the age of puberty, 12 to 13 years. I suggested at that time and have since been giving these patients the ductless gland extracts. I give one and then the other, as there is no method of telling which one is deficient. You will notice in all the cases of ozena that there is hardly a thyroid gland palpable, and on that assumption I begin to feed the patient thyroid extract. The patients have all improved, but none of them has been entirely cured. Physically they are all better; some of them I have mixed with the thymus and pituitrin and in some of them I have injected adrenalin, but after sifting them all through, thyroid extract with a cleansing solution gives me the best results.

DR. BAKER, Bay City, Mich.:—I think there are some features which have not been brought out by the essayist or the speakers. I think there is a climatic connection with the development and presence of ozena. In other words ozena, where I am, on the Great Lakes, is not a common affection. In the interior, where the atmosphere is dryer, you will find it more frequently than we do. I think also that a good many cases of ozena, so called, are purely of syphilitic origin, and when you eliminate that class of cases the balance of them will be found a small proportion of the total number of cases you see. I wish to say that within the last few years I had a case of ozena in a young girl in which we isolated a colon bacillus and an autogenous vaccine cured the case. The girl was about 12 years of age when I saw her. I think we have not got in the ductless glands the secret of our ozena cases. I think it is a local infection and is not always the same infection.

DR. FRANZ PFISTER, Milwaukee, Wis.:—I had a practical demonstration a few years ago of the transmissibility of ozena and it seemed to me then that there must be a specific micro-organism producing it. The professor in a European clinic was on his vacation and his assistant was doing his work. He had three cases of submucous septum nasi resection. I knew those patients before the operation for I had examined every one of them. There was no sign of ozena in any of their noses. I was surprised to see him do these submucous operations without what I thought sufficient indications for them. After the operation the patients developed an absolutely perfect case of crusts in the nasal cavity on either side, and it took weeks before the constant reformation was stopped. It was treated with a 25 per cent. solution of ichthyol and glycerin. I asked the

operator what his explanation was. I told him also that the condition looked much like ozena, except that the odor was not present. He admitted that perhaps he had infected those patients because he was a sufferer from ozena. Examining his nose I found he was an ozena patient of an advanced type.

DR. MURRAY (closing) :—I have not anything in particular to add. In 1913 this question of the presence of the Perez bacillus as a cause of ozena was of sufficient importance to have it referred to an international committee and it was to be reported upon at the meeting in Hamburg this past summer, so the question of the Perez bacillus has become an important one, and that, in connection with the favorable reports which were published by Hofer and others, led me to take up this investigation. As far as our results are concerned it is an entirely negative paper. In regard to lues being a frequent cause of ozena, I do not think I can agree with one of the speakers. In these cases of ours Wassermann was done repeatedly in every case and there was no positive Wassermann reaction in any, nor was there any other clinical evidence of lues.

CONSERVATION OF THE TURBINATES

J. A. PRATT, M.D., F.A.C.S.

AURORA, ILL.

In bringing this seemingly simple subject before this society, I have no apologies to offer. It seems quite vital to me, and the approbation of this society would mean a great deal to the rhinological men of this country who look to this society for their standard of work.

In this plea for conservation I do not mean to avoid the radical operations, which should be performed according to the judgment of the operator, but to use them as a last resort, and place our energies so as to give the patient a nose as nearly normal as possible. It seems to be the idea of a great many rhinologists to operate a nose so that an admission of a volume of air will be the immediate result rather than restoring the nose to its physiological function. Few of us realize the disagreeable result to the patient by having improperly warmed and moistened air passing through the nose.

I wish to cite three cases that tend to prove this point. These cases were operated on some eighteen months ago by men who have had both American and foreign special teaching.

The first patient came to me complaining of a dry sensitive nose. He had been operated on for a partial stenosis. On examination I found that both the lower turbinates and the anterior two thirds of the middle turbinates had been removed, and a thick crooked septum was allowed to remain. The condition could undoubtedly have been relieved by a submucous resection of the septum. Possibly this patient could not be persuaded to have a submucous performed. If so, was the operator justified in doing this mutilation? Do you think if the patient was told what the after results of the operation would be that he would have given his consent?

The second case came to me following an operation performed one year ago. She was wearing a piece of cotton in the right nostril, and when I asked her the reason for so doing she said the air hurt her head. Since the operation she still had her headaches and discharge from the nose. The examination showed that the entire right middle turbinate had been removed, and that there was still a purulent ethmoidal sinusitis. This

discharge and headache ceased after four injections of bacterins and eight applications of the vacuum pump. Of course, there is the question whether the condition would have been relieved by this line of treatment without the removal of the turbinate. I have cured the majority of my cases by this means, so I place these bacterins as a help toward conservation.

The third case was a dentist near Pullman, Ill., who came complaining of sensitiveness in the region of the left middle turbinate. The examination revealed a high deviation of the septum on the left side and the removal of the entire middle turbinate, which operation had been performed eighteen months before to give ventilation. The septum operation would have relieved this case.

Since September, 1912, I have paid particular attention to conservation of the turbinates. At that time I decided to let the hypertrophied turbinates which we find in deviated septa to remain and watch the results. After a few months of observation I read a paper on "The Etiology of Hypertrophic Rhinitis" at the State Medical Meeting in Peoria, Ill., in May, 1913, from which I wish to quote the following: "We take exception to two statements in the above; first, that the increased negative pressure causes hypertrophy, because we find that the hypertrophied turbinate is on the concave side of the deviation where the breathing space is the greater, and where the negative pressure would be the less if there was a negative pressure, which we do not believe. Second, that the contact of the deviated septum with the turbinate causes it to still further hypertrophy, because as a matter of fact the turbinate that is pressed upon by a portion of a deviated septum shrinks and atrophies.

"When a person cannot obtain enough air through the nasal passage he becomes a partial mouth breather and this fact, in our mind, precludes the possibility of a negative pressure in the nasal chamber.

"We believe that localized hypertrophy of nasal tissue, when the septum is normal, is caused by the irritation of the abnormal secretions, as in sinus diseases, etc. If the sinus condition could be cured without destroying the hypertrophic tissue, this tissue would tend to return to normal if it is a simple hypertrophy.

"We believe that when we have a normal septum, with no sinus trouble present, and there is a turgescence that closes the nasal chamber, or we have an alternating stenosis, we should look to the irritating condition of the blood, due to autointoxica-

tion from whatever cause. If this blood supply to the part continues there will be hypertrophic tissue formed.

"In years past when we had hypertrophy of the turbinate opposite the concavity of a deviated septum, we removed all or part of the turbinate or gave it linear cauterizations. In the cases where we used the cautery with seemingly perfect result, we found when the patient returned after some months that the condition was nearly as bad as ever. It was not until we began the corrective submucous operation of the septum that we discovered the condition improved instead of becoming worse as time passed. All of us have seen this, not only in our own cases, but in those operated on by others. For over a year now we have not operated on our simple hypertrophied turbinates, but corrected the septum, and where we left a turbinate lying against the replaced septum, the turbinate would decrease in size until the space was nearly normal; while the atrophied turbinate on the convex side of the septum would increase in size.

"The two functions of the nasal cavity are to warm and moisten the air as it passes to the lungs. It is with these two functions that we have to deal in discussing the etiology of hypertrophic rhinitis. In a normal nasal cavity the air is equally distributed on each side of the septum, and there is a normal space between the turbinates and the turbinates and the septum, so in complete turgescence the nasal cavity can be entirely closed. In the physiologic action of the normal nasal cavity, there is just turgescence enough to properly heat and moisten the air as it passes to the lungs. The stimulus that acts upon the nerves to regulate the amount of blood to these parts is the amount of air passing through a given side of the nasal cavity. If this amount is increased there is a greater turgescence; if less, the turgescence is decreased. As the amount of blood to a part determines whether it shall hypertrophy or atrophy, so in this instance we have hypertrophy or atrophy according to the increase or decrease of the amount of air passing through the nasal cavity.

"When we have a deviation of the septum, as from an injury, the bent septum causes an enlarged nasal cavity on the concave side and a smaller nasal cavity on the convex side. Following the natural physiologic impulse, there is an extreme turgescence on the concave side to properly heat and moisten the extra volume of air that is passing through. As this cavity remains large, the chronic dilatation of the venous plexuses causes their walls to thin to a point where the contractile tissue cannot empty the plexuses, and we have the soft boggy condition of the turbinate

that undoubtedly precedes the hypertrophic condition. On the convex side the reverse takes place and we have atrophy. This explains the conditions as we find them.

"If the above etiology is true, it behooves us to be conservative with our turbinates, and try to restore the septum to its proper position."

I have a gentleman here who demonstrates that the above theory is along the right lines. This was the first case I watched and was operated on a little over two years ago. At the end of the operation and for a number of weeks following, the lower and middle turbinates on the right or concave side of the septum were tight against the septum, so that he was unable to breathe through his previously free nostril. As you see (patient passed around) the turbinates are about normal, and the atrophied turbinates on the opposite side are now of good size, and by questioning the gentleman you will find that his nasal distress has entirely gone. I have other cases that prove this position, but I think this one enough. My belief is, that if we operate on the thickened and deviated septum, that our abnormal turbinates will tend to become normal, that the improved ventilation will tend to stop the recurrent infections of the sinuses and bring the nasal cavity to its normal physiological action, and while this will not take place at once, it is well worth waiting for, both by the patient and the operator.

Our first step, then, in the conservation of the turbinates is the correction of the thickened and deviated septum. In sinus diseases the sheet anchor of relief is the ventilation of the nose, and in nearly every case it can be performed by the submucous resection of the septum, and allow the turbinates to remain in place. In secreting sinuitis, we have the treatment of suction by the vacuum pump as recommended by Dr. Brawley, and which I have used with remarkable success for a number of years, and which I suspect is not generally used by the rhinologist. We have the use of the bacterins, both autogenous and the stock, with which I have had very satisfactory results, although others have not. But I believe it is a treatment that should be tried before the radical operations.

I have written to a great many rhinologists in the United States to find out what they consider the best operations on the sinuses to conserve the turbinates. The consensus of opinion was that the Denker, modified Denker, or the preturbinal operations were the best for the maxillary sinus, and conserved the lower turbinate.

For the frontal sinus nearly all would sacrifice the whole or greater part of the middle turbinate. Too much praise cannot be given Dr. Mosher for his work on the ethmoidal labyrinth, which I had the pleasure of seeing him demonstrate at Boston last October. This gives us access to the frontal sinus in the great majority of cases by the removal of the superior overhang of the middle turbinate, and practically gives access to the anterior ethmoids, with very little loss of the anterior end of the middle turbinate; possibly surgical drainage of most of the posterior ethmoids could be accomplished by extending the work posteriorly and above the middle turbinate, removing, as it were, the superior turbinate.

Dr. Skillern suggests the use of the Faraci forceps to penetrate and bite away part of the anterior wall of the sphenoid for surgical drainage, without sacrificing the middle turbinate. This method could be used before the radical sphenoid operation.

All operators are apt to wish a brilliant early result for their operations even if the turbinates are sacrificed, than to take a slower and possibly a second operation course, with better results for the patient. This is not viciousness but thoughtlessness.

CONCLUSIONS

While we formerly removed the hypertrophied turbinates or cauterized them, thinking they were the cause of the nasal stenosis, we now know that the hypertrophied condition is due to the deviated and thickened septum, and the irritating discharges from the diseased sinuses.

Diseased sinuses are caused to a great extent by improper ventilation of the nose.

The best after-results of nasal operations obtain when the turbinates are conserved as much as possible.

The septum should be made as normal as possible, the vacuum pump employed, bacterins used and simple surgical drainage of the sinuses should be performed before the radical operations are employed in sinus diseases of the nose.

DISCUSSION

DR. J. SHELDON CLARK, Freeport, Ill.:—I believe with Dr. Pratt, that there has been too much indiscriminate work upon the turbinate bones for nonoffending cases of hypertrophic rhinitis. This I am sure does not obtain with careful workers of this Academy, but is more apt to be the case with what we might term dilettantes who are engaged in rhinological work. My experience with the submucous resection is that I get free breathing where before it might have been considered advisable to remove the turbinates. The "Kopflichtbad" as used in the Killian clinic

is a very good adjunct in the treatment of these cases of acute exacerbations in an already existing hypertrophic rhinitis.

With the use of bacterins I have had but little experience; the trouble is to know from just what strain of bacteria the vaccine shall be made. If we are to use a vaccine it should be an autogenous one.

There is one point in regard to nasal obstruction, other than deviations of the septum, and that is, at the entrance of the nose. We seat our patients down in a chair, take up our head mirror and the speculum and open the nose, but we often do not observe the condition present. I mean conditions of the alae, where the cartilage is not firm, and every time an inspiration is taken the ingress of air is hindered by these sunken cartilages, or, perhaps by misplaced columnar cartilages. Frequently plastic work in the vestibule will avoid the necessity of doing the submucous operation. And, again, if we have done a submucous, we will many times have a nose which is more competent after doing this preparatory work in the vestibule.

In regard to the sinuses, we should secure drainage and proper ventilation, and we should do all we can before resorting to operations, but we should not put off the operation until we have all the dire results that may follow. In regard to the submucous operation in general, I am not in a position to operate every case of nasal septum that is simply deviated. How often do we examine the nose and find irregularities and yet the patient is free of breathing trouble. Therefore, this subject of nasal stoppage is, to my way of thinking, altogether relative. As to negative pressure this is hard to prove, and is largely theory. In regard to the etiology, aside from deviations of the septum, as being a cause for this conditions we must, of course, go further and inquire into the habits of the patient as to exposure, improper clothing, diet and many other conditions.

DR. JOSEPH G. PARSONS, Sioux Falls, S. D.:—I wish to illustrate a little bit what I have to say. There is one point worth considering in being truly conservative in this matter, and that is dealing with that type of turbinal which we speak of as the intumescent type, which precedes the real hypertrophy, where the connective tissue has become so dense that the turbinal no longer shrinks under the application of adrenalin or when pressed with a probe. Now, this condition is very frequently met with and often times the enlargement may be so very decided that it is a great deal of discomfort to the patient and we may not be able to get them to submit to a septal operation, although they may need it. For instance, an enlarged lower turbinate; a condition which we know is due to the marked dilation of the erectile tissue (illustrated on the blackboard). Now this is the condition you so frequently find with alternating stenosis; one side and then the other side of the nose plugs up. Now it would be obviously unwise to take off a chunk of that turbinal. These are the conditions which very frequently are subjected to linear cauterization. To meet this particular condition I have for some time been making use of a little bit of technic which I have been calling some of my friends' attention to, a submucous destruction of the erectile tissue by means of what I call my bread knife (on exhibition by Hardy). The knife is especially curved, and there are some waves on it, and a relatively sharp point. After anesthetizing the nose with a nonischemic anesthetic-like alypin (not cocain or adrenalin), the knife is entered into the anterior end of the lower turbinal and with a sawing motion back and forth this erectile tissue is chopped up, if you please; the dilated venous spaces are broken down. Then the knife is turned on edge, down to the turbinate bone. This is for the purpose of lacerating periosteum

so there will be anchorage to the turbinal when you introduce the Simpson tampon. When the tampon swells it takes up space, the turbinal shrinks back in place, and the tissue which has been broken down by means of this bread knife forms a scar which is adherent to and anchors to the periosteum of the turbinate. This tampon is left in for forty-eight hours and there is very little discomfort, and the beauty of the thing is there is no destruction of mucosa and the scar holds the erectile tissue down to the bone where it stays put.

DR. R. W. BLEDSOE, Covington, Ky.:—About a year and a half ago before the Southern Medical Society at Lexington, Ky., I read a paper entitled, "A Plea Against the Still too Frequent Sacrifice of Turbinates." I congratulate Dr. Pratt upon the presentation of his paper and heartily agree with him in every particular and more. I am also much pleased to see the marked similarity of our ideas in the conservation of nasal mucosa.

I wish to speak of the class of cases in which we find a marked deflection of the septum, into the concavity of which an enormous inferior turbinate projects beyond the median line (illustrated on blackboard). I would like to lay particular emphasis upon this condition, because I know that in correcting such intranasal deformities it is customary to first remove a large portion of the inferior turbinate so as to admit of the membranous septum, after the resection, hanging perpendicularly in the median line without touching the inferior turbinate or its stump. It has been my good fortune, by exercising a little carefulness, to save all or practically all, of the inferior turbinate in these cases. This is done by making a line of pin-hole perforations about one-eighth of an inch apart along the upper surface near its junction with the outer wall, by the aid of what might be termed a small right-angle knife needle. Then with a small instrument resembling an Andrews tongue depressor placed on the mesial surface, the turbinate is fractured, its free border being pressed downward and outward so that the plane of the turbinate is changed from horizontal to perpendicular. In the vast majority of instances this is where the turbinate operation stops; however, it occasionally happens that the depressed free border of the turbinate touches the floor of the nasal chamber. When this occurs I remove a narrow strip about a quarter of an inch in thickness from the lower border with the aid of scissors or saws, whichever appears to be the more convenient. I then proceed with the submucous resection. By such conservative surgery the patient is not later annoyed by the dry throat which frequently follows in the wake of excessive and needless sacrifice of the turbinated bodies.

In the submucous resection, when properly done, we have one of the most valuable nasal operations, if not the most reliable, of which we know today. I am convinced that by it alone more good and permanent results may be obtained than with any others. Unfortunately, there are about as many varieties of submucous resection as there are operators. Each is satisfied with his own technic.

In my humble opinion, when this operation is indicated at all, it should be complete; by this I mean not to stop short of the removal of all spurs or thickened cartilage or bone of the septum, no difference where situated. Not infrequently the triangular cartilage above at junction with perpendicular plate of the ethmoid is very thick, sometimes as much as a quarter of an inch. To leave this or a spur on the vomer would not be doing the operator, the operation nor the patient justice.

To dissect up septal flap and remove a piece of cartilage does not constitute a submucous resection in its full sense, as was intended by its originators.

Another suggestion I wish to make is that those cases in which operative procedures are indicated upon the middle turbinate. When it is deemed necessary to remove only a portion, say the anterior half, before that case is finally dismissed be sure that the inspiratory current is not still interfered with by the remaining posterior portion.

If such is the case and this patient be discharged it is a question of time only until he consults another specialist for what he terms difficult breathing, from which he has been only partially relieved by the previous operation.

DR. GEORGE W. SPOHN, Elkhart, Ind.:—The turbinates, as represented by the last speaker, are not so general. The removal of the turbinates becomes a mathematical question: the patient requires a certain amount of oxygen, and the openings of the nose should be large enough to admit all the air that is needed. I agree with the essayist, that the correction of the deviated septum should be first; but if the "crushing operation" of the turbinates will not supply sufficient space, then a portion of the turbinates should be removed. Some of the discussants seem to convey the idea that the turbinates should never be removed. I admit that too many swell bodies are removed; but with the proper measurement of the nares, the space for the proper oxygenation of the blood can easily be ascertained.

DR. G. M. CASE, Elmira, N. Y.: I believe in a certain number of cases of apparent nasal obstruction, with consequent mouth breathing, the turbinates are normal in size, and any operation on them is injurious. We may remove bony spurs and correct septal deflection, and also any obstruction in the nasopharynx, but still the patient complains of inability to breathe freely through the nose. It is in these patients we find a very high arch hard palate. Their expression is characteristic. Upper lip appears too short, and the upper jaw appears to project over the lower. In this class of cases I believe we should call in the dentist to help us out. In early life I believe much may be accomplished by mechanical means, by broadening out the floor of the nose.

DR. PRATT (closing discussion): I would like to state that I practice in a town of 35,000, and I know that these things can be done. One thing I want to lay stress upon and that is these compensatory hypertrophies of the turbinates. If that septum is straightened and those turbinates left alone—I do not think it makes any difference whether it is a hypertrophy of the bone or the mucous membrane—they will tend to decrease. These cases show improvement rapidly after six or seven weeks. Nature will reabsorb that hypertrophy which has been placed there to compensate for the cavity and you will be surprised what good results they get.

TRANSACTIONS
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OPHTHALMOLOGICAL DIVISION

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OPHTHALMOLOGY IN RELATION TO OTHER SPECIALTIES AND TO GENERAL MEDICINE

ADDRESS OF THE VICE-PRESIDENT

ROBERT SCOTT LAMB, M.D.

WASHINGTON, D. C.

Such a subject is limitless in its ramifications and one is compelled to consider only the present-day relationships. The past has been well covered by Max Kneis, Jackson and others whose works are more or less familiar to us.

If it be not presumptuous I should like to remind you of the intimate anatomic relation of the eye to the circulatory (blood and lymph) and nervous systems, which, it seems to me, should always be borne in mind when we attempt to understand either the etiology of ocular diseases or the *modus operandi* of any treatment suggested for their cure.

No structure without proper foundation can stand. Therefore in our work we should try to build our theories on the firm foundation of our knowledge of the embryology, histology, anatomy and physiology of the eye, together with what we can learn of physics and chemistry, rather than presuppose some condition, then try to prove it without reference to fundamentals, and have some one with a few facts of research and attention to details dissipate all figments of our imaginations. Pardon these few words of caution if they seem too critical.

You know how much has been written on subjects relating to ophthalmology and will sympathize with me when you realize what I have had to read and discard as useless in my review of those collateral branches of medicine which have a bearing on, or a relationship to, ophthalmology.

There is in all probability no specialty which does not touch the eye in one or more ways. It is, therefore, essential, not only that the ophthalmologist knows something of all other specialties, but that specialists in other subjects and general practitioners should know something of ophthalmology. This latter is a condition which rarely occurs; however, it seems to me to be true that many ophthalmologists have a desire to know something of the other specialties and of general medicine and fulfil

that desire, at least in part. It is, perhaps, unfortunate that more of them do not have the same tendency.

The question has arisen in my mind from time to time, and probably in the minds of many of you, as to whether ophthalmology, which in the early history of intra-ocular study (following the invention by Helmholtz of the ophthalmoscope) contributed so much to general medicine by the study of ocular manifestations of disease, is contributing its full share at the present time to the advancement of other sciences. And by its full share I mean all that it is capable of contributing. If one asks, Is it contributing as much as most of them? I think there is no question that an affirmative answer can be given. But that it is contributing all that it is capable of I feel we must answer in the negative.

One reason for this appears to be the neglect of opportunities to cooperate with our colleagues in the general hospitals and help in the elucidation of their diagnoses in obscure cases.

Because of the diversity of their cases, they neglect the almost constant use of the ophthalmoscope necessary to skill in accurate estimation of the value of intra-ocular findings.

Their neglect is forced on them by circumstances, and we can hardly hold them responsible for it, even though we believe the ophthalmoscope would be of much service to them if they would learn its use to the extent of being able to differentiate gross lesions of the fundus oculi.

As their ignorance of our subject and the possibilities it offers of throwing light on their problems prevents their calling on us for help, it has seemed to me timely to suggest that we make the value of our assistance known to them and it will soon become necessary to them. Such an understanding between themselves and ourselves would be advantageous to us all, and our patients most of all.

It could be begun by our asking to be allowed to examine any very interesting or obscure cases — just a personal request — showing interest in their work. A little judgment in the study of such cases with the discussion of findings, and possibly a few suggestions for treatment made at the request of the clinicians would help them to understand the value of our work.

This would eventually lead us to opportunities for the study of the diseases in vogue and occupying the attention of the medical profession, such as pellagra, for instance, in which some of us have had the good fortune to follow the changes in the fundus due to nutritional disturbances.

This subject would be incomplete without a consideration of the things ophthalmology is doing for the other branches in medicine and what they in turn have lately done and are doing for ophthalmology.

The perimetric work done in the study of diseases of the pituitary body has made it possible to accurately diagnose some cases and so enable the skilled surgeon to perform wonderful operations of great scientific value.

Brain tumors, brain abscesses discovered and meningitis diagnosed, with the assistance of the ophthalmologist, have been successfully treated by the surgeon.

The spiral scotoma and enlarged blind spot, with or without finding confirmatory fundus changes, have pointed the way to operations on the frontal, ethmoidal and sphenoidal sinuses and the antrum of Highmore.

The lagophthalmos or papilledema, associated with mastoid abscess, may be the deciding symptom in diagnosing obscure cases. An induced nystagmus for diagnosing labyrinth disease is most helpful to the aural surgeon.

The dental specialist comes in for his share of benefit through the work sent him by the thorough-going ophthalmologist who believes the eye symptoms due to dental affections.

Tubercular uveitis may point the way for the control of a case of pulmonary tuberculosis, and the condition of a pneumonia patient may be approximately prognosed by a study of the fundus oculi.

The fundus may suggest mitral regurgitation—aortic stenosis—and embolism of the central retinal artery suggests vegetative endocarditis.

Vitreous opacities point to a study of the gastro-intestinal condition, even though the general health seems good.

Parasites occurring in the eye make necessary an investigation of the intestinal tract.

The eye early shows jaundice.

Blepharospasm — xanthelasma — ischemia, with photophobia, chorioretinitis and choroiditis are associated with uterine disorders, which have had no attention because so many persons take for granted that they themselves are normal, and whatever condition exists is usual. An interrogation into the history permits of a suggestion by the ophthalmologist that an examination by a competent gynecologist be made as soon as possible.

Gonorrheal ophthalmia, iritis or ocular lues, give opportunity for cooperating with the genito-urinologist and serologist.

The fundus further suggests early arterial and venous changes, renal disorders and diabetes; this is further suggested by cataract in middle life.

It is considered necessary to evacuate the gravid uterus when certain ophthalmic signs are present.

Splenic disorders need the assistance of the ophthalmologist for their proper study.

Furthermore, the internist must hereafter come to the ophthalmologist for cooperation in the study of the internal secretory glands, for the eye early manifests functional disturbance.

As for the neurologist, we are so closely bound to him that we might almost say, "Useless each without the other," which is strikingly true in some instances.

Many other separate illustrations might be given for the elaboration of the subject; however, in all fairness, we should now allow an opportunity to show what the other specialists are doing to help us elucidate our problems.

The roentgenologist localizes foreign bodies for extraction by us, treats our skin cancers with Roentgen ray or radium, pictures the skull for tumors of orbit, or by showing the presence or absence of the posterior clinoid processes, indicates the absence or presence of brain tumor.

The opsonic index has helped us to better understand and treat conjunctivitis, keratitis and uveitis.

From those studies the serum therapy has developed to benefit our patients suffering with gonorrheal ophthalmia and iritis, pneumonic conjunctivitis, phlyctenular conjunctivitis, serpiginous ulcer, etc. Again, the treatment of syphilitic lesions of the eye by salvarsan, neosalvarsan and mercury injections, controlled by the agglutination and precipitation tests, has marvelously accelerated recoveries.

The rhinologist by operation helps cure the ocular symptoms resulting from sinusitis, acute or chronic.

The dentist helps us by treating or removing teeth which by reflex action are affecting the nutrition of the delicate structures of the eye.

The brain surgeon has in some cases been able to assist us in restoring sight by the removal of brain tumors.

The general surgeon we have turned to to remove the cervical sympathetic ganglion in glaucoma, to ligate the vessels in exophthalmic goiter and to remove part of the thyroid.

To the dietitian we owe our thanks for assistance in the management of our cases resulting from faulty metabolism, such as phlyctenular ophthalmia.

It is my belief that all this and much that has been left unsaid for want of time, to elaborate the subject, proves that a present-day opportunity exists for the ophthalmologists to possess among their number men as necessary to their fellow practitioners, and as highly esteemed and honored as, Agnew, Loring, Noyes, Norris, Williams of Boston, Williams of Cincinnati, St. John Roosa, Thomson, Knapp, John Green, Sr., and others.

I wish to express my thanks for the high honor you conferred on me by electing me to the vice presidency of this Academy and I hope with your kind cooperation to satisfactorily serve you.

THE ETIOLOGY OF IRITIS AS DETERMINED BY LABORATORY METHODS AND ITS TREAT- MENT, ESPECIALLY BY BACTERINS

WENDELL REBER, M.D.

PHILADELPHIA

In this communication, which is largely in the nature of a preliminary one, I am impelled to bring before you the question of the etiology of iritis largely by a feeling of profound dissatisfaction with the present-day statements as to its etiology. A survey of many recent textbooks reveals approximately the following classification (the one here shown being offered by Fuchs):

1. Iritis syphilitica.
2. Iritis rheumatica.
3. Iritis gonorrhoeica.
4. Iritis scrofulosa.
5. Iritis tuberculosa.
6. Iritis in acute infectious diseases.
7. Iritis in disorders of metabolism.
8. Iritis traumatica.
9. Iritis sympathica.

Manifestly this classification merely enumerates the varieties of iritis. It is a clinical classification, pure and simple, and advances us precious little beyond the classifications of fifty years ago. Writing in 1898 Brailey,¹ the elder, said: "Syphilis is without doubt the most common predisposing cause of iritis. Most authors credit the venereal disorder with 50 per cent. of all cases, but that estimate is too low, especially if hereditary syphilis be taken into account, and the proportion probably lies near 60 per cent. Rheumatism is responsible for most of the other cases, so that we shall not be far wrong if we lay 30 per cent. to the score of that ailment. The remaining 10 per cent. are due to various causes of which injuries, gonorrhea, gout, diabetes and malarial and other fevers are probably the most important. We may vary this statement by saying that out of

1. Norris and Oliver: System of Diseases of the Eye, iii, 285.

every ten cases of iritis, six will in all likelihood be the result of syphilis, inherited or acquired, while three will be caused by rheumatism and one by some one of the other conditions above enumerated." De Schweinitz quotes Alexander (*Syphilis und Auge*) to the effect that syphilis has been found to be the cause in from 30 to 60 per cent. of all cases. De Schweinitz also makes a most trenchant observation when he says "Iritis is also divided according to its *supposed* (italics my own) etiology into syphilitic, rheumatic, gouty, gonorrheal, diabetic, tubercular, scrofulous, cachectic, traumatic and sympathetic iritis." The word "*supposed*" in the foregoing sentence indicates this acute observer's dissatisfaction with the present-day classification. The statistics up to the present day are not without interest. H. H. Brown² found 55 to 65 per cent. of all his cases of iritis to be syphilitic, while a proportion varying from 10 to 20 per cent. he credited to arthritic toxins. Jennings and Hill,³ tabulating 500 cases of iritis from the records of the Wills Eye Hospital, put down syphilis as the cause of 61.4 per cent. and rheumatism in 25.4 per cent. of the cases, gonorrhea at 5 per cent. and other general systemic disorders as 8 per cent. Of 159 cases of primary iritis, studied in the wards of St. Bartholomew's Hospital between 1883 and 1900, Yeld⁴ found 29 per cent. certainly syphilitic and 17 per cent. probably syphilitic; 16 per cent. seemed rheumatic but careful analysis of the so-called rheumatic cases failed to show positive evidence of true rheumatism; 8 per cent. were certainly gonorrheal and 7 per cent. more were probably due to this virus; toxemic cases amounted to 10 per cent.; 1 per cent. were due to gout; 1 per cent. were osteo-arthritic, and 10 per cent. were obscure, the latter being most common in women. Among the latter exposure to cold seems to have been a prominent factor and the majority of such patients were admitted in February. Harrison Butler,⁵ four years ago, called attention to the discrepancies in the reports of various authorities as to the frequency of various etiologic factors in the production of iritis. For instance Kenneth Campbell found 70 per cent. of all iritis due to syphilis, 20 per cent. to gonorrhea, 9 per cent. to orolimentary, uterine and tubal infection, and 1 per cent. to tuberculosis. He absolutely denies the existence of rheumatic iritis, in which opinion one might observe he is joined by de Schweinitz. Römer found 25 per cent. due to syphilis, Worth 30 per cent.

2. Brown, H. H.: *Ann. Ophth.*, April, 1899.

3. Jennings and Hill: *Ophth.*, vi, 52.

4. Yeld: *Brit. Med. Jour.*, May 13, 1911.

5. Harrison Butler: *Brit. Med. Jour.*, April, 1911.

and more than 50 per cent. to oral sepsis and kindred conditions. In view of this wide divergence of opinion, Butler thought it worth while to go through his case books (both private and hospital) to determine what proportion must be allowed to the different sources of infection. The net result of his inquiry was that in at least 30 per cent. of all cases it was impossible to determine the real cause of the disease, 25 per cent. were due to syphilis, and 5 or 6 per cent. could be termed truly rheumatic. Three years ago L. Bach⁶ collected all cases of so-called primary disease of the uveal tract observed at his clinic during the last sixteen years — numbering about 400 — and had them reexamined as far as possible and had the Wassermann test made. The most significant passage in this whole article is the statement that *"very often the history of the case and the most careful general examination revealed no clue as to the etiology. This was true in 47 per cent. of the cases of iritis and 59 per cent. of the cases of choroiditis."*

To what does this array of discrepancies amount when submitted to critical analysis? Simply this: It amounts to precisely nothing. All the classifications and percentages above quoted are based on clinical findings; and as long as we adhere to that basis of classification alone we shall be floundering in the pool of empiricism.

One thing is certain, namely, that an important percentage of all cases of iritis is due to syphilis, but how many? According to the figures reported, anywhere from 20 to 70 per cent. It is no exaggeration to say that if such a variation were submitted in evidence in any other department of science, the evidence would be laughed out of court. It may well be asked, Is there any prospect that we shall soon find a way out of this maze of contradictory evidence, and if so how shall we come to a knowledge of the true percentages? The answer would be that in the present state of our science the percentages cannot be fixed with absolute accuracy. But I would here intrude the hope that if recent laboratory methods are rightly utilized we shall come much nearer the truth than we have yet approached. The history of the case and its clinical aspect can never be disregarded but if, in conjunction with these, the laboratory reports are allotted a proper place, I believe we shall discover much that will surprise us.

The laboratory findings that are now at our disposal fall under what are known as complement-fixation tests and comprise reactions as to the following organism: The *Spirocheta*

6. Bach, L.: Ztschr. f. Augenh., January, 1912.

pallida (Wassermann test), gonococcus, pneumococcus, streptococcus, *Staphylococcus albus*, *Staphylococcus aureus*, *Bacillus influenza*, *Bacillus coli*, *Micrococcus catarrhalis*.

Five of these organisms have already been shown to sustain a causative relation to iritis. The *Spirocheta pallida* and the gonococcus are already well known in this relation. Bradburne⁷ has shown the streptococcus as causative. Gray Clegg⁸ has recently reported uveitis going on to enucleation in which the pneumococcus was the sole organism cultured from the specimen. It is noteworthy that three other ophthalmic surgeons who saw the case with Clegg diagnosed a tubercular process. Finally, I have recently reported a relapsing iritis⁹ that seems to have been due to postinfluenzal toxins, Wassermann, gonococcus and all other save influenza fixation tests being negative. It responded beautifully to influenza bacterin without any other internal treatment. There is little reason to doubt that the staphylococcus family will sooner or later be similarly held on the same count.

Jellett¹⁰ has just recorded a case of iridocyclitis which had trypanosomiasis as its underlying cause, which is far afield from our usual ideas of causation of this malady, but at the same time points out all too plainly the need for exhaustive study in every case of iritis that is not frankly syphilitic.

In the past year I have studied closely fifteen cases of primary acute iritis ten of which were in private practice and five in hospital practice. In every one of these fifteen cases a complement-fixation test for the following organisms was made: Wassermann (Noguchi and cholesterin), gonococcus, pneumococcus, streptococcus, *Staphylococcus albus*, *Staphylococcus aureus*, *Bacillus coli communis*, *Bacillus influenza*.

Of these fifteen cases, five were clinically syphilitic and gave frankly positive Wassermann reactions. These were certainly syphilitic. Three gave a negative Wassermann but a positive gonococcus reaction. In no one of these cases was gonorrhea clinically in evidence in spite of the closest study. Their gonococcemia was therefore latent and could be recognized only by the complement-fixation test, which when positive, is of the greatest value. Moreover, it may be held now as fairly conclusive that a positive gonococcus complement-fixation test is not to be expected in the course of an acute gonorrheal infection, or within six or eight weeks from the time it began to sub-

7. Bradburne: Ophth., viii, 175.

8. Clegg, Gray: Ophthalmoscope, June, 1915, vol. xiii.

9. Ibid., Ophth. Rec., November, 1915.

10. Jellett: Ophth. Rev., xxiv, 41.

side. It is only when after the lapse of some months the organism has gained entrance to the general circulation that a positive fixation test may become possible.

One of the fifteen cases was negative to all but the influenza bacillus to which the reaction was positive. The prompt results of treatment with influenza bacterin seemed to clinch the etiologic diagnosis in this case.

Another of the fifteen cases was negative to all the organisms mentioned. This case exhibited thirteen recurrences in fifteen years and is undoubtedly an antotoxemia, as treatment on this basis will abort most of his attacks oftentimes without the use of any atrophin at all. He frequently shows indican in his urine. It is a matter of exceeding interest that iritis has occurred in eight other members of this man's family, including cousins, aunts and uncles (two generations). This would indicate undue susceptibility of the iris tissue in this family to any toxic substances present in the blood current.

One other of the fifteen cases was negative to all the organisms mentioned. Clinically, this man was tubercular, as he was the subject of tubercular joint disease, so that with the exclusion of the other factors his was probably a case of tubercular iritis. Unfortunately he left the hospital early and his case could not be followed up.

This disposes of eleven of the series of cases. Of the remaining four, two cases were studied in women, in both of whom all the laboratory tests were negative. The teeth also were negative. Both of them improved greatly on injections of influenza serobacterin, one promptly and the other slowly. Hence we are justified in the suspicion that they were quite as likely due to postinfluenzal toxins as to any other cause and probably more so. The two remaining cases occurred in men one of whom presented a low form of iritis complicating a pre-existing choroiditis, and I am strongly inclined to suspect syphilis in his case in spite of the negative Wassermann. The other man had a typical plastic iritis but negative laboratory reports all through. This man was a hospital case and disappeared before his case could be adequately studied from the clinical and historical standpoint.

SUMMARY

Of fifteen cases of primary iritis five were certainly syphilitic. Three (20 per cent.) were certainly due to the activity of the gonococcus. One (7 per cent.) was certainly due to post-

influenzal toxins. One (7 per cent.) was due to gastrointestinal toxemia. One (7 per cent.) was most probably due to tuberculosis. Two (14 per cent.) were negative to Wassermann and doubtfully syphilitic. Two (14 per cent.) were negative to all laboratory tests and the history and clinical aspect of the cases were against syphilis. They had both had influenza two or three months prior to the iritis, but their accessory sinuses were pronounced negative after a thorough-going rhinologic examination. As a therapeutic test they were both treated with influenza bacterins and both made final recoveries. The long drawn-out one of these cases which was really a uveitis also had a long course of iron, quinin, arsenic and strychnia.

Briefly, then, of the series 33 per cent. were certainly syphilitic; 14 per cent. were possibly syphilitic; 20 per cent. were gonorrheal; 6.5 per cent. were influenzal; 6.5 per cent. were tubercular; 6.5 per cent. were autotoxic; 14 per cent. were obscure in origin.

These percentages take into account the laboratory tests, the clinical aspect of the eyes and patient, and the history of the case, and this we believe to be at the present writing the nearest approach to accuracy that can be obtained in working out a true etiologic classification. It would be absurd to offer or even attempt to offer any working conclusions based on so small a number of cases. As I have already said this is but a preliminary communication and is presented because of its suggestive help. Let me here indulge the hope that in a year or at most two, a sufficiently comprehensive array of cases may be brought forward on which conclusive data may be built up.

Lest some captious critic may assail the reliability of the present-day complement-fixation tests, I think it may be said that as far as the Wassermann test is concerned its findings are fairly accurate if the latest technic is rigidly adhered to. It is perfectly true as shown by Uhle and McKinney¹¹ that there is a greatly varying equation of error in the reports of different serologists varying from 5 to 50 per cent. I cannot refrain from quoting their closing sentence: "Leaving aside the element of personal equation serologists cannot obtain uniform results unless a standardized antigen is employed and a uniform technic is agreed upon." Personally I am not willing to lay aside the element of personal equation. If one serologist can show an equation or error of but 5 per cent., it would seem that other serologists could by rigid adherence to the most successful

11. Uhle and McKinney: *Jour. Am. Med. Assn.*, Sept. 15, 1915.

technic arrive at the same degree of successful results. At this particular juncture I wish to acknowledge my great debt to Drs. A. P. Hitchens and Claude Brown of Philadelphia for their unfailing courtesy and unceasing energy in conducting all the laboratory tests referred to in this communication.

The gonococcus complement-fixation test has also been criticized as to its uncertainty and Drs. Kolmer and Brown¹² have said very frankly: "The reactions (gonococcus complement-fixation) are not generally as satisfactory as those occurring in the syphilis reaction because the quantity of gonococcus antibody is much smaller unless grave and widespread gonococcus metastases exist." On the other hand, a positive gonococcus complement-fixation test is of the greatest value, and I have made a diagnosis of gonorrheal iritis only in those cases in which the reaction has been positive. The reaction for penumococcus, streptococcus, staphylococcus and influenza are as yet not as reliable as the syphilis and gonococcus fixation tests, but if available they should be carried out even if they only occasionally furnish positive reactions. The one case of influenzal iritis I have reported seems to me to justify this attitude.

TREATMENT

As to treatment, it will go without saying that in the presence of a positive Wassermann our therapeutic course is plain. Salvarsan and neosalvarsan are brilliantly efficacious under such circumstances. Nothing has been more interesting, however, in the past two or three years than to see our syphilologists come back to the use of mercury in addition to the arsenical preparations in the treatment of syphilis. Six years ago, at the meeting of the Medical Society of the State of Pennsylvania, I hazarded the opinion that it would be wise to hold fast to our good friend mercury as an antidote to Venus until our new friend arsenic had provided its worth, and I am today as unwaveringly devoted to mercury as I was then.

But it is to the iritis of nonspecific characteristics that I wish to direct especial attention. In this class, which assumes a formidable minority, we may sometimes secure a positive gonococcus fixation test, in which case the indication for bacterin or vaccine treatment is plain. The results also abundantly justify this claim. The relief from pain following the use of bacterins (gonorrheal or others) in iritis of nonluetic origin is

12. Kolmer and Brown: Jour. Infec. Dis., July, 1914, xv.

almost as prompt as that following the use of morphia. Even in the presence of a negative gonococcus-fixation report if there were arthritic involvement of any degree whatsoever I should not hesitate to use a Neisser mixed bacterin, not only as a therapeutic measure but as a therapeutic test.

Some comment should be made on the fact that rheumatic iritis has not only not appeared in the classifications above presented but has not even been mentioned in this communication. This is because of our belief that cases heretofore so classed are either due to latent gonococcemia or to gastric intestinal toxemias. Rheumatic iritis as a nosalogic entity is destined to eventually disappear from our text books and literature.

If there were no arthritic manifestations and all other courses could be excluded, I feel that an experimental injection of influenza mixed bacterin is justified. According to our present-day experience, it can do no harm and it may surprise us by doing unexpected good. In which case we shall have applied a therapeutic test that is of no mean value.

Nothing could be further from my purpose than the advocacy of indiscriminate bacterin therapy. It is a danger with which the profession is just now gravely threatened. My whole plea is for the most exact indications for any therapy by means of laboratory tests, close clinical observation and the most careful study of the body metabolism. If I have said nothing about the local treatment of iritis it is because of my feeling that the profession is practically a unit on that point. What the ophthalmic profession just now needs in the domain of the uveal tract is not more treatment but *more light* which we fervently hope will lead us to better and more accurate treatment of this malady that is fraught with such grave consequences to the precious function of sight.

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DISCUSSION

DR. G. B. JOBSON, Franklin, Pa.:—At the International Medical Congress which was held in London a formal discussion was entered into by Fuchs, deSchweinitz and others on the low-grade form of iritis, which we used to call serous iritis, Descemetitis, and keratitis punctata; and which is now called chronic uveitis. The discussion dwelt on the cases not produced by syphilis, tuberculosis or sympathetic causes, and the consensus of opinion was that uveitis chronica was of septic or toxic origin. Last week at Philadelphia I read a paper on "Uveitis," which was based upon ten cases treated during the past year. The etiological factor in three was autointoxication; in two, chronic rhinopharyngitis. One of the group suffered from a severe case of pyorrhea alveolaris. Associated with the uveal attack was a polyarthritis, both of which promptly cleared up by extraction of the teeth and treatment of the gums. The

findings in the remaining four were negative. Fuchs tells us to beware of mistaking chronic uveitis for glaucoma, as there is a similarity in some of the signs and symptoms. Two distinguishing features are a deep anterior chamber and a characteristic exudate on the posterior surface of the cornea, which may be graded from a few dots to an extensive deposit, pyramidal in shape, with the apex up.

DR. R. A. REEVE, Toronto, Canada :—We should congratulate Dr. Reber on using caution, because in this instance he has safeguarded himself by referring to the small number of observations. I think also he will admit that it will require an exhaustive study of cases of gonorrhea to determine how many there are with iritis and how many without. Of course, fifteen cases would hardly give the average supplied by 1,500. However, as this is only a preliminary presentation, any doubtful factors will be eliminated by so acute an observer as Dr. Reber.

DR. NORMAN W. PRICE, Niagara Falls, N. Y. :—What does Dr. Reber mean by "intestinal intoxication?" Can there be an iritis without germs actually growing in the iris tissue? Does intestinal intoxication of itself produce iritis; or do the germs that are producing the intoxication also produce an active iritis by growing in the iris tissue, or does this intoxication lessen the resistance of the iris tissue so that some germ can lodge there? We need a better definition for iritis due to the so-called intoxications and the so-called rheumatism.

DR. ROBERT SCOTT LAMB, Washington, D. C. :—If other men have been using these methods of treatment and diagnosis, it seems to me a good time to bring out the fact. Those of us who have used them are rather delighted with them, and I would be glad to hear from any one who has been using these methods of diagnosis and treatment.

DR. REBER (closing discussion) :—I was moved to write this paper by the consideration of the fact that in 1893 when I first attended the Wills Hospital, a man would present himself with iritis and would be asked, "How long since you've had it?" If he admitted he had had an infection, he got mercury, and if he denied it he got mercury. If he was not helped by mercury he was given other treatment, and gradually a true etiology was worked out in some cases. I have seen many cases of iritis put down as syphilitic that I do not think were syphilitic. The proportion will fall according as the cases are carefully studied as to the etiology. On account of the small number of cases reported in my communication, I intended to bring out in the discussion my hope that we might have twenty volunteers who would agree to secure specimens of serum for complement-fixation tests and send to me and I will see the tests are made; if then they will keep these records I believe we shall secure an investigation that will tell us what we want to know. At present we are nowhere. I believe we will find many cases of pyorrheal iritis and gonorrheal iritis and some gastro-intestinal iritis. There are people who show a continued indican reaction, who do poorly on a purin diet; these people are suffering from perverted body chemistry. They are not suffering from the presence of germs within the eye but from the toxin of germs that found lodgment in the intestinal tract. My plea is that we shall no longer classify iritides as those that get well under mercury and those that do not. I will be glad if any members will write me if they are willing to take up this investigation.

THE ADAPTATION OF THE TEST CARD TO ITS DOUBLE FUNCTION

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The test card is in common use for two quite distinct purposes: (*A*) It furnishes a test for visual acuity by which the great mass of our records of vision are obtained. (*B*) It also serves as an apparatus by which successive changes in visual acuity, by improvements in focussing on the retina may be followed for the subjective measurement of ametropia. As with most pieces of apparatus designed to serve two different purposes, it is not perfectly adapted to either.

For the simple testing of visual acuity, as for testing the sight of schoolchildren or railway employees, the usual test card will in time give place to some such simple form of test as the international broken ring. But for the subjective testing of refraction the card of test letters, imperfect as it is today, is for the mass of patients, far superior to any other means at our command. As it exists it is much better adapted to this purpose than for giving valuable records of visual acuity. But even if it were used only for testing refraction, we still would wish to be able to record directly from the test card the vision obtained with the combination of lenses used. So we will always need to have it fitted to performing both functions.

As a test for visual acuity (*A*) each letter or each line of letters should have a definite and known visual value, and there should be a known and fairly equal difference of visual value between the successive lines. On the other hand, the series of test letters is of more value for the subjective testing of refraction (*B*) in proportion as it is a continuous series without considerable breaks in it. For testing visual acuity we must know just what it means when a certain line of letters is read at a certain distance; and the ideal arrangement for this purpose would be to have all these letters just visible at the same distance. For the subjective testing of refraction the ideal arrangement is one that will show every improvement in the lenses by the recognition of at least one additional letter, the letters on each line differing from each other in visibility, and some of the letters next smaller becoming visible as soon as all of the

larger size had been recognized, thus furnishing a continuous series.

When Snellen, acting on Donders' suggestion, attempted to arrange a series of test type in which the size of the letters should bear a definite relation to the distance at which they should be seen (five-minute angle), he immediately encountered the enormously differing visibility of different letters subtending the same angle. For his test cards he at once rejected all lower case letters, and all capitals, except the one-block letter form. Later he narrowed the series down by excluding many of the capital letters of the alphabet, leaving only fourteen, which he used. Yet when we come to compare these with a definite standard, like the international standard or the Snellen illiterate test, we find that among these fourteen letters the visibility varies over 30 per cent.; the B can be recognized at only 20 feet, while the O of the same size is recognized at 28 feet.

Oliver carried this selection of letters still farther, rejecting all but seven. Yet these varied over 20 per cent. in visibility. But others who have arranged test cards have extended the number of letters employed; until, on cards now in use, almost every letter in the Roman alphabet has been employed. While other alphabets, as the German, Hebrew and Slavic, are also in use for sight testing in this country.

The exclusion of letters has been to secure closer conformity to a definite standard of visual acuteness. Yet Oliver's card varies one fifth in the significance of the different letters used; although for the smaller letters it has sacrificed the continuity of the series, on which chiefly depends the value of a test card for the subjective measurement of errors of refraction.

But the most striking absurdities of our test cards have arisen from failure to recognize the relative visibility of the letters employed in particular lines. This causes striking gaps in one part of a series and overlapping in other parts. On our test cards there are lines of letters, in which there is not more than 5 per cent. difference between the distance at which one can recognize the easiest letter and the distance at which he can recognize the most difficult. There are other lines for which the difference is fully 50 per cent. There are test letters, as Oliver's, on which there is a distinct gap between successive lines of letters. There are other cards on which, before all the letters on one line can be read, half of the letters may be recognized on the line of next smaller letters. There are even some cards in use on which all the letters on the 6-meter line can be recog-

nized slightly farther away than all the letters on the $7\frac{1}{2}$ -meter line. The single 60-meter letters that head most of our test cards indicate widely different degrees of visual acuity. These vary in significance when the card is used at 5 meters from 0.07 to 0.12 vision.

To meet these differences in the visibility of the different letters and render more exact our records of visual acuity, most of us have resorted to the expedient of supplementing the fractional record suggested by Snellen by adding some word or sign as "6/6 mostly," "6/6 partly," or "5/4 +," or "5/4 —." When making all records of visual acuity from one card this does tend to give them exactness. But when the records made from one card come to be compared with records made from another card, it simply introduces a new source of confusion. The 5/5 partly on one card may be a record of better vision than the 5/4 mostly from another card. The more definitely exact we attempt to be with a variable scale, the greater the confusion we have to encounter.

So long as a constant figure like the Snellen illiterate test or the broken ring is used, the proportioning of the size to the distance at which it should be seen by the eye with normal vision, constitutes an advance over the empirical method on which series of test letters had previously been based. But with letters or figures varying greatly in visibility there is no substitute for the actual trial of visibility, the empirical method of ascertaining the real visual significance of each letter.

The substitution of the subtended angle for tests of visibility has led to many absurdities on our test cards. One firm has published a card with very large letters to render possible the testing of very poor vision at the usual distance. The top letter is marked for 150 meters, the second for 100 meters, and the third for 60 meters. Ignoring the different visibility of the different letters they made the largest letter B and the smallest T. Consequently, although the letters fill the card so as to leave a very insufficient margin, they form a very poor series. The 150-meter line is seen but little farther than the 60-meter letter on some other cards, and less than half as far again as the 60-meter letter on this card. Had the sizes of the B and T been reversed the largest letter could have been seen almost twice as far, and the series would have tested variations in visual acuity more than three times as great.

One of the cards of figures arranged for testing young children begins with a clock dial, that occupies a square subtending

an angle of 5 minutes at 60 meters. So it is numbered as a 60-meter test. But to recognize it as a clock dial one must recognize that there are hands and hours marked on it. To do this requires as good vision as to recognize the usual 12-meter line of Snellen letters. Although it subtends the 5-minute angle at 60 meters it belongs with the 12-meter line of letters as a visual test.

Enough has been said to illustrate that only when the same figures or letters are used does the distance of visibility bear a fixed relation to their size. If we are to rely on a card printed with two or more letters the visual value of these letters must be actually tested by some fixed standard before the card can be regarded as furnishing a scientific test. When this has been done it will be possible to use various letters or figures and get results of scientific accuracy. In what a haphazard manner test letters have been used in the past has been illustrated in some of the instances given above. But it has been most forcibly brought out by the collective study conducted by the Committee of the Section on Ophthalmology of the American Medical Association, appointed to undertake the standardizing of test cards.

The report of this committee, just published in the Transactions of the Section, shows the extremely imperfect character of the test cards in common use in this country. Very many of these cards have lines of letters on which the letter easiest to recognize can be recognized 50 per cent. farther than the letter hardest to recognize. In tables appended to the report an attempt is made to give the significance of recognizing half the letters on each line and all the letters on the line. The difference in visual value between seeing half the letters and all the letters was in no line less than 5 per cent. It was often as high as 20 per cent.

But these figures scarcely indicate the whole difficulty. Very often almost the whole difference between recognizing half the letters and all the letters on the line, depended on the difficulty of seeing a *single letter*. Perhaps nine tenths of the letters would be recognized almost as easily as one half. Then would come a single letter like B, S, or a defective G, or poorly printed R, that could only be made out at a much shorter distance. On other lines no such difficult letter would be used. In this way the series of lines becomes far more irregular in visual significance than the variations in size or subtended angle would indicate.

SUMMARY

The most serious defects in our test cards are due to failure to recognize the practical importance of differences in visibility, between different letters and figures subtending the same angle that are now used upon such cards. The variations thus introduced are many times greater and more serious than those caused by measuring the angle on the sine, arc or tangent, or failing to place the card so that the patient's line of sight shall be perpendicular to it. They are worse even than the variations in the color and character of the surface on which the letters are printed; and quite as misleading, and far more difficult to guard against, than the variations in the lighting of the test cards.

The remedy for such defects is the careful standardizing of the letters used. Something of this kind has been undertaken by the Committee of the section on Ophthalmology of the American Medical Association. But the subject deserves careful thought on the part of every one who uses test cards, and some effort of each to thus standardize his own cards. To apply to those cards, and utilize the tables, prepared by the committee above mentioned, will be of great value in promoting exactness in all our records of visual acuity.

DISCUSSION

DR. WILLIAM WILDER, Chicago:—This is an extremely important subject and we should feel indebted to Dr. Jackson for bringing it up and advocating the adoption of some standard of visibility. The force of his argument must appeal to all of us. We are all reminded of cases where we have difficulty in bringing the patient's vision to 20/20, regardless of the degree of illumination, and how difficult it is for them to read some letters on a line while they can read readily many of the letters on the next smaller line. There can be no question at all as to the advisability of having some sort of standard made, in view of the fact that these cards are printed by so many different firms and often without sufficient regard to their exact size. It would seem that when we want to do really accurate work we must resort to the broken ring or the figures on the illiterate chart. I hope there will be some work started by committees of the different societies to bring about some standardization of these letters. I would like also to see a standardization of the notation of the charts. I mean by that the notation of each line of letters. The disposition now-a-days is to indicate or record the vision of the patient as $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, etc., which is confusing, but it is better to record such visual acuity as 20/40, 20/60, 20/80, etc., and not reduce the fraction to its lowest terms because otherwise we have no exact indication of the test that was made. If he uses the distance from the chart as the numerator, and for the denominator the size of the letter we have a perfectly clear idea of the conditions of the test. Furthermore, it would be much better to have all our charts constructed so that the sizes of the letters or figures would be indicated in terms of the meter.

DR. ROBERT SCOTT LAMB, Washington, D. C.:—It would be a good thing to try to induce the United States government to get away from the old 20/20 into the metric system. Everything has been translated into these terms; 20/20 is their standard instead of the metric system.

DR. JACKSON (closing discussion):—I think I have nothing to add, except that it is a subject that will grow on you if you will study it. You do not, as I did not, half appreciate how worthless, unscientific and inaccurate our records of the acuteness of vision are. You cannot get an accurate result of the correction of an error of refraction with an inaccurate test or know what the patient sees.

SUBJECTIVE TESTS FOR ASTIGMATISM, ESPECIALLY ASTIGMATIC CHARTS

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BOSTON

There are several very good subjective tests for astigmatism. This is fortunate, for one should not rely on a single test whether subjective or objective, but always confirm or correct the results obtained with one test by one or more independent tests.

Objective tests, be it said once for all, are not only valuable, they are indispensable. Yet they should be corrected by subjective tests, and in the last analysis it is usually the findings by the subjective test which determine, and ought to determine, our treatment.

It was Donders who first made a practice of treating astigmatism with cylindrical lenses. His favorite test was the point source of light in a dark room. By altering the distance of the source or by using + and — spherical lenses, one can shift the focus forward and back so that different cross sections of the refracted pencil fall on the retina. It is a valuable laboratory experiment to do this with a sphero-cylindrical lens, focussing a pencil from a small source of light, virtually a point, onto a movable screen. As the screen is moved back from the lens the shape of the light area on the screen changes. Close to the lens it is nearly the same as the aperture or pupil of the lens, say circular (Fig. 1, A). Farther back it becomes elliptical (B) and the ellipse narrows to a line (C)—the anterior focal line—then it widens into an ellipse (D) which soon becomes a circle (E)—the focal circle; as we continue to move the screen back this circle lengthens out into an ellipse (F) which becomes a line (G)—the posterior focal line—at right angles to the anterior focal line and both at right angles to the axis. Beyond the posterior line the shape is an ellipse again (H). The whole geometrical figure is called the conoid of Sturm and that part between the focal lines, the focal interval of Sturm. The focal circle is not far from the middle of the focal interval, a little nearer the anterior line. The anterior focal line is shorter than the posterior, and therefore an image would be less blurred when the screen was at the anterior focal line than the posterior, but it would be smaller. More important is the fact that the

direction of one focal line may be more advantageous for a clear image than the other. For example, vertical focal lines make a clearer image of many letters than do horizontal or oblique ones, so that if the anterior focal line were horizontal it would not be so favorable to clear vision as the posterior, which in that case would be vertical.

A smoke box is a very satisfactory way to demonstrate this conoid of Sturm. Figure 1 is the well-known diagram.

In the eye one never gets a set of images just like these for there always are irregularities — aberrations of various sorts — which cause the path of the refracted pencil to depart from the regular form. These aberrations all appear in the images we get when a point source is looked at with a series of + and — spherical lenses. There is no known test which compares with this for the minute study and analysis of the various aberrations of the eye. Just here is the weakness of the method for office use — it shows too much. A trained observer, studying these images with great minuteness and care, can secure a wonderfully complete analysis of the dioptric condition of his eye, but for office practice it has fallen into disuse. Yet an intelligent patient can often give us useful information, and we can show him why it is impossible to give him, with the lenses at our disposal, the complete and perfect correction of his refractive errors which he would like to get. It is a resource which is worth knowing though not to be recommended for routine use. (See Tscher-ning: *Physiol. Optics*, Chap. x; Gullstrand: *Arch. f. Ophth.*, liii; see also Figure 4).

Donders' next test was what may be called the visual acuity test. One uses the Snellen test letters and selects first the strongest convex or weakest concave spherical lens with which best vision is obtained and then tries to improve V. with convex or concave cylinders of various strengths tried at various angles. The special value of this test, as Donders pointed out, is for the confirmation or correction of results obtained by other tests, objective or subjective. One puts in the trial frame the lenses selected by other tests and then tries by weak + and — cylinders at different angles placed in front of these to still further improve V. A crossed cylinder is useful to confirm results. It is not necessary to go into the details of the employment of this test for it is very widely and successfully used and is described in most of the textbooks. It is of especial value under cycloplegia; without cycloplegia only great care and a perfect grasp of the conditions under which the patient is seeing and how his ciliary muscle is acting can avoid error.

Perhaps the stenopaic slit should be mentioned next. Its use is so well understood that I will pass on to the astigmatic charts. These were elaborated and perfected by Dr. John Green, then working with Donders and Snellen. His papers were published in 1866 and 1867. The article in the *American Journal of Medical Sciences*, 1867, is especially worth reading for very little has been added to either theory or practice as there set forth. It is a matter of just pride that this, as some of us think, the best subjective test and skiascopy, as all of us think, the best objective test of astigmatism were both elaborated, expounded and perfected by Americans, the former by Dr. Green and the latter by Dr. Edward Jackson.

I have intimated that in my opinion the astigmatic charts are the best subjective test for astigmatism. This view is by no means shared by a majority of ophthalmologists. Hess (Graefe,

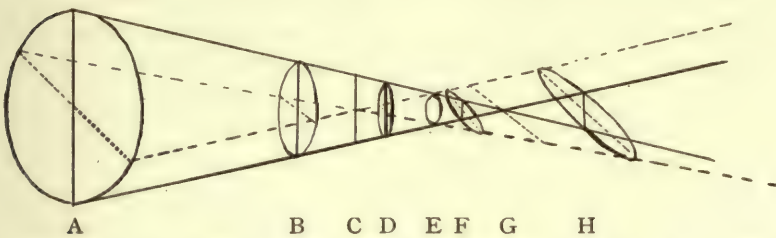


Fig. 1.—Conoid of Sturm. Regular astigmatic refraction of a pencil of rays. The letters mark cross sections of the pencil; A, close to the lens, C, at the anterior focal line, E, at the focal circle, G, at the posterior focal line, the space from C to G is the focal interval.

Saemisch, Hess, Handbuch) quotes with approval from Gullstrand, the Swedish giant of ophthalmology, winner of the Nobel prize for his work in dioptrics: "This test is always uncertain, often it cannot be employed." Souter, declared by H. Knapp to know more about the dioptrics of the eye than any American ophthalmologist, says in his text book on the Refractive and Motor Mechanism of the Eye: "I have found the radiating lines unsatisfactory in practical use." Others, less frank, while not condemning it so flatly, damn it with faint praise. I judge that the test is not at present taught in most of the postgraduate schools — mentioned, of course, and described, but not so taught that a novice could use the test with assurance of success. All this sounds like a very strong case, *is* a very strong case against the test. All that I can say on the other side is that I have found groups of ophthalmologists widely scattered over the country, from Montreal to Baltimore and from Boston to St. Louis and

probably beyond, who are using the astigmatic charts daily as one of their most valued and reliable tests. These are men whose opinions you and I justly hold in the highest esteem. Moreover, many of them are finding that they can measure with precision the astigmatism as to axis and amount by skilful use of the astigmatic charts *without cycloplegia*. Since this is precisely my own experience I speak with great boldness, knowing that my statements have the backing of men of the best training and soundest judgment. I urge all beginners and all who are not so fixed in their ruts that it is hopeless to expect them to change, to give this matter careful investigation. I believe that the cause of failure with astigmatic charts is traceable to incorrect methods of using them. I therefore invite you to consider in detail the choice of charts and the technic of their use.

The classic form of astigmatic chart is Javal's clock dial, adopted by Green and universally known. The intervals between the groups of radiating lines are 30° . Of course, one cannot determine so accurately the angle of the astigmatic axis with this chart as with one having the lines at smaller intervals. Many use lines with intervals of 15° , but 10° seems to me the best interval. When a patient says two adjacent radii are equally black, for example 80° and 90° , we know that the true axis is between the two and is 85° or very near 85° ; while if we were using the 15° chart a patient with axis at 85° would see the 90° line better than the 75° and would probably make us decide the axis to be 90° , or if he said 90° is best, 75° next best, 105° third, we should know that the true axis was less than 90° , but could not estimate so accurately how much less than 90° as we could with the 10° chart. (See Fig. 3.)

If the chart is small a 10° interval brings the lines pretty close together. This is easily avoided by having a large enough chart. I prefer one about 50 cm. square, permitting radii to be 20 cm. long with a clear space in the center about 10 cm. in diameter. The line or lines which are clearest are selected by the patient with the aid of the examiner who moves a pointer along the ends of the radii till arrested by the patient. The pointer should be large enough to be easily seen by the patient and should be held parallel to the radii which are being pointed at, since then the pointer is clearer cut and also it is much more definite which line is being indicated. My pointer is a long paper cutter, 5 cm. wide near the end and tapering rapidly to a blunt point. The presence of visible numbers at the ends of the lines distracts the patient's attention.

When the astigmatism is small, say less than 1 D., the patient will select a group of several lines, often five or more, as darker and clearer. When the astigmatism is much higher, say 2 D. or more, only one or two or at most three lines will be called clear. The reason is easily understood. The blur caused by a low degree of astigmatism is so slight that it is hardly noticeable on lines that are not at much of an angle with the best meridian. It is harder to determine the exact axis, but a departure of 5° from the true axis is a matter of little importance when the cylinder is less than 0.50 D. This is impressively shown when you try to neutralize a weak cylinder of unknown axis by another cylinder, or when you try to determine the focal length of a weak lens of any sort by measuring the distance from lens to clear image. The image is about equally clear over a fairly considerable range, especially if the aperture or pupil is not large. It is important to have this and similar facts clearly in mind in order to appreciate at their true value the answers of the patient and to know when his uncertainty is due to the uncertainty of the thing he is observing and when it is due to his dulness, or again to appreciate when his positiveness is not warranted by the facts but is forced, as is characteristic of some patients.

What is the best width for the lines? Some writers say they should subtend a visual angle of 1 minute, others that they may be larger. The great majority recommend 1 minute. Briefly the facts on which to decide the matter are these: When the accommodation is in abeyance and one meridian and one only is in sharp focus the narrower the line the sharper the contrast; for, while the best line stands out clear and black under these conditions, the others are very easily blurred because they are so narrow and the lines at right angles may be absolutely invisible. For use at 6 m., lines then may be as small as the letters not only of the 6/6 line but even of the 6/5 or 6/4 line, and yet give a very sharp and easily seen axis (Fig. 3). When the vision is fogged, that is, when not even the best meridian is in clear focus while the others are still more out of focus, such a chart is much inferior to one with wider lines. This is because a narrow line is so easily blurred that fogging throws the whole chart, including the clearest meridian, hopelessly out of focus, and as a result no line is selected by the patient as clear. Now, as we shall see, the patient should practically always, when the test is applied, be wearing a glass which does produce this blurring or fogging in even the best meridian. Therefore the narrow lines

are inferior to wider ones. How wide? I have been in the habit of teaching that the lines should have about the width of the letters of the line to which the patient is fogged. Starting with a lens at least 2 D. stronger plus than our estimate of what he would select for best vision, we gradually reduce this strength till, supposing his vision to be normal, he is able to read 6/10 or 6/12. On this basis the lines of the astigmatic chart should subtend about double the 1-minute angle. As a matter of fact, I determined this optimum width empirically years ago before

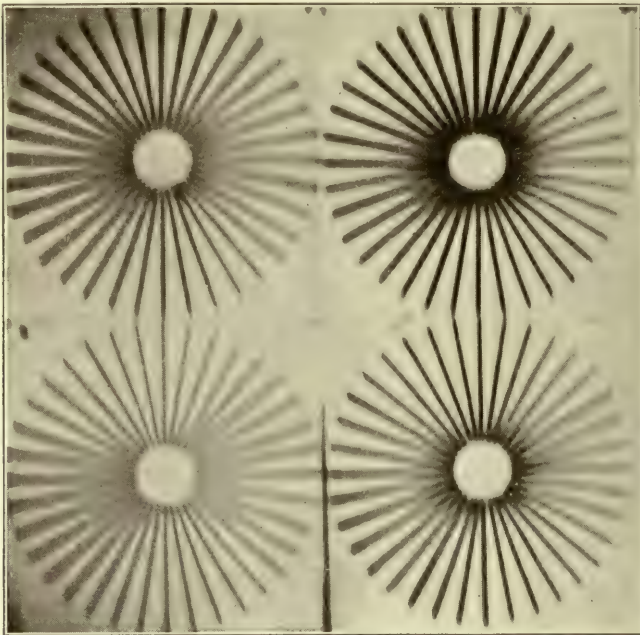


Fig. 2.—Charts with lines of different widths. Fogged with a $+0.50$ sph. Cyl. also $+0.50$. If it were not fogged the chart with the narrowest lines would show the astigmatism most evidently, as it is the lower right-hand chart is better. In the lower left the lines are as wide as 6/6 letters, in the lower right, wide as 6/12 letters, the best size on the average. For a patient with higher astigmatism and poor vision, the upper right chart with lines equal 6/20 would be better.

attempting to explain it. I found that I got clinically decidedly better results with lines about that size or a little larger. Then I made this explanation of the reason. Lastly, I have photographed charts of various sizes under various conditions which seem to me to confirm the clinical and theoretical conclusions (Fig. 2). When vision is defective one may use to advantage lines as wide as 3 minutes.

Should the radii be in groups of three or single? There is something to be said in favor of threes, and I used them for a

long time on one of my charts. My reasons for abandoning them are these: A very common effect of spherical aberration and astigmatism is to produce polyopia, often well-marked diplopia. Now if a group of three lines, the lines and interspaces measuring 2 minutes each, is doubled and the doubling happens to cause the two images to separate by an angle of 2 minutes, then we shall get superposition of one set of images on the other in such a way that two of the lines of one group will overlap the two adjacent lines of the other group, making them doubly black. One of my photographs (Fig. 6) illustrates this very perfectly. One sees three horizontal lines, but vertically there *seem* to be but two, and these equally as black as the horizontal, although the horizontal is the meridian that should be clear and the vertical blurred. Clinically the same thing occurs. A patient will say that he sees three lines one way and only two the other, or even only one. To say that the lines appear colored is also very common and is evidence not of foolishness but of keenness on the part of the patient. These distracting and confusing phenomena are less when there are only two single lines crossing each other than when there are two groups of three. This was pointed out by Verhoeff, *Ophthalmic Record*, 1899.

Should the charts have concentric circles crossing the radiating lines and similar lines crossing the two diameters, as in the two Verhoeff charts? Since the circles are always at right angles to the radii where they cross them, they are always blurred where the radii are clearest. The effect of the blurred circles is to convert the white background into a mixture of white and black, that is, to make it less white and so reduce the contrast between the black radii and their surroundings (Fig. 3, B). Now, of course, what we want is the maximum contrast; we want the blackest black line and the whitest white card the printer can give us to make the contrast as telling and striking as possible to the patient. To accomplish this I have long used for the black lines strips of black velvet ribbon (baby ribbon No. 1 or No. 1½, of the stores) glued to the whitest card I could get, which was the so-called wedding stock. This chart is used for determining the axis of astigmatism, not to determine its amount. For this we want a chart with only two meridians—that of maximum and that of minimum refraction—because the multitude of lines is a source of trouble and confusion. If the trial lenses are not placed before the patient's eyes with their axes exactly right the effect is not simply to equalize the two meridians of maximum and minimum refraction, that is, to correct

the astigmatism, there is an undesired and troublesome effect of changing the axis and making a different group of lines clear on the chart. Moreover, it is not always possible to make all the lines on this chart appear equal, whatever we do in the way of cylinders. It is far better therefore to change after we have determined the axis and use a chart with only two lines at right angles to each other to represent the two principle meridians. These lines may be a little narrower than those of the first chart, but since the patient is still fogged, or should be, it is better not to have them as narrow as $6/6$, but about $6/10$ or $6/12$. This chart is pivoted so that it can be set with the main axis at any angle. For the reason given above it is better to have a single line than a group of three or more.

To recapitulate: The best astigmatic chart for determining the axis is one with lines about the size of the letters of the $6/12$ line, about 20 cm. long, radiating at 10° intervals, the lines the blackest black and the card the whitest white obtainable. (While a complete circle is not essential, I think it is better.) The best chart to determine the amount of astigmatism is a cross which can be rotated to any axis, the cross consisting of two lines at right angles to each other about the width of the $6/10$ line.

METHOD OF USING CHART

When the patient is told to look at the chart he may say that the lines are all alike—he sees no difference. This may be (1) because they *are* all alike in the image on his retina, or (2) because he fails to notice the difference. It is important for us to be able to tell which is the case and how to deal with it.

If they all look alike because they *are* all alike in the image on his retina, it must be either that he has no appreciable regular astigmatism, or that he is neutralizing any astigmatism by his accommodation, or in some other way. Can this be done? Unquestionably and very frequently. Let me cite a common example. Miss X., an astronomer and trained observer, about 45 years of age, has $V. = 6/4$; her astigmatism in the right eye is nearly 2 D. With the left eye covered and the right wearing her full correction, the lines on the chart look all alike and the arms of the cross placed so as to correspond with her principal meridians, look equally black. Holding a $+0.25$ cyl. before the eye with its axis parallel first to one principal meridian and then to the other, she detects easily the difference in the lines on the cross and which way the axis is held. A $+0.12$ cyl. is tried in

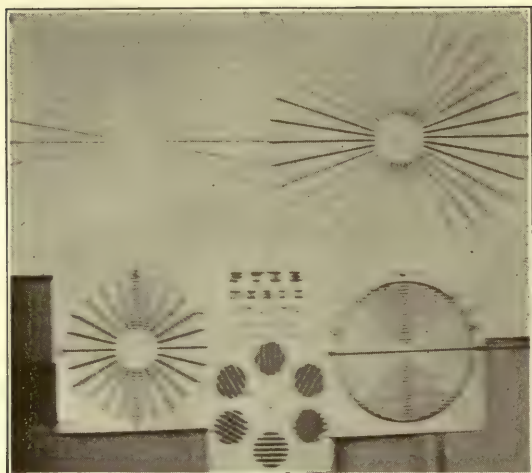


Figure 3A

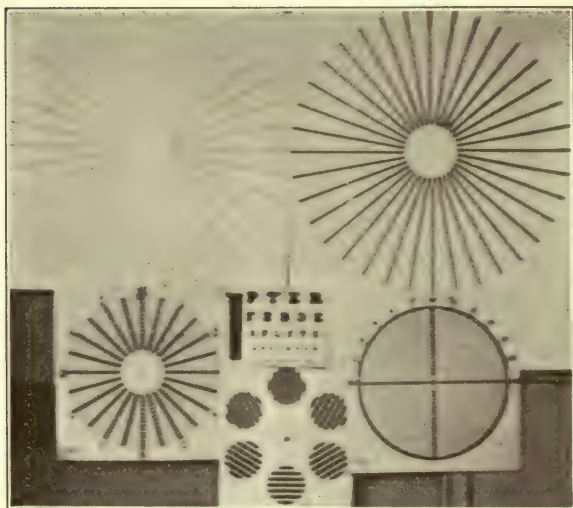


Figure 3B

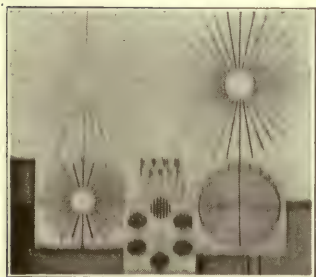


Figure 3C

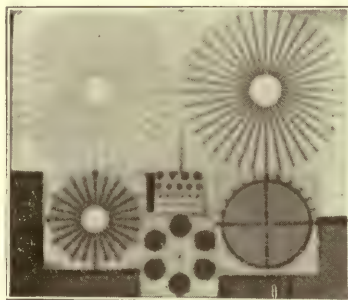


Figure 3D

Fig. 3.—Astigmatism neutralized by accommodation. The photographs A and C show the appearance of the chart when the camera is focused and then a 75 cyl. placed before the lens. The photographs B and D show the appearance when the same cyl. is before the camera but the focus is shifted to bring the interfocal circle on the plate, thus neutralizing the effect of cyl. by "accommodation." The result is a slight fogging, about equal to half the strength of the cyl., say 0.37 D. (Note that the narrow lines on the dials become almost invisible when there is a little fogging, while the wider lines are more easily seen.)

the same way and is always correctly detected, though less promptly. This shows that she can detect an inequality in the lines as small as 0.12 D. with precision. A -0.12 cyl. is next tried and the lines all look alike. Next a -0.25 cyl. and still they are alike, whether it is held parallel to one principal axis or the other. With a -0.37 cyl. the lines are still all alike. The same with a -0.50 cyl. except that she now remarks that they are less clear though equal. With a -0.62 cyl. the lines are no longer equal; this lens makes the lines at right angles to its axis blacker, whichever way it is held. The experiment was repeated, first placing a $+0.50$ sph. before her full correction. This reduced V. to $6/10+$. She now detected the -0.25 cyl. as easily as she before detected the $+$ cyl., for of course it is, the same to the eye whether you place a $+0.50$ cyl. axis 90° before it or a $+0.50$ sph. $\odot -0.50$ cyl. axis 180° . This experiment shows that this patient could neutralize any cyl. up to and including 0.50 when the conditions were such that she could exercise her accommodation. When a $+$ cyl. was added to her full correction, of course accommodation could only increase the error and so accommodation was not used. So when the eye was fogged with a $+$ sph. and a weak $-$ cyl. was added, accommodation could only make matters worse. It is important to add that this patient was watched to see to it that she kept her eyes open in a natural manner exposing the pupil. The pupil was about 4 mm. in diameter. Unless one does watch the patient's lids, he is liable to be misled rather frequently. Partial closure of the lids forming a stenopaeic opening will largely correct astigmatism or any other refractive error and so obscure the true condition. Bull and Hess have both written at length on this source of error and illustrated it by photographs.

There can be no doubt that cases where the patient can and does neutralize his astigmatism by his accommodation are frequent; in fact, they are the rule.* This explains why many ophthalmologists have condemned the test, especially if used without cycloplegia. They have found that the patients often failed to see any difference in the lines even when astigmatism was present. Many have thought that this proved the power of the ciliary muscle to contract unequally or partially, and so to neutralize the astigmatism of the cornea by an opposite equal astigmatism of the lens. One can find in almost any volume of the *Year Book* reference to writers who espouse this view. Starkey

* Lundolt, Refr. and Accom. of the Eye, p. 302.

(*Jour. A. M. A.*, 1895) gives a list of twelve standard authors, most of whom agree with him in this opinion. The conclusion is not warranted. The only conclusion warranted is that the ciliary muscle by accommodating neutralizes *in some way* the astigmatism of the eye, if it can be shown that partial contraction is not necessary to explain the facts that makes such an explanation improbable, for other reputed proofs of partial contraction have failed to stand the searching analyses of George Bull and von Hess.

Apparently the following simple but convincing experiment has never been reported before.

If a camera is focused and then made astigmatic by say a 0.75 cyl. the image of an astigmatic chart will show a marked difference in the lines as they appear on the ground glass (Fig. 3, A, C). But if the focusing screw is turned a position is easily found where the lines look all alike (B, D). The camera has neutralized the astigmatism by its focusing which, of, course, cannot be unequal or partial, but must be uniform in all meridians. The focusing, while it makes all the lines look alike, does not make them sharp and clear. So the astronomer patient observed that with the — 0.50 cyl. the lines though all alike were not clear.

The reason is obvious. The part of the focal interval which now falls on the retina or photographic plate is the interfocal circle which does not blur one line any more than another, does not produce any astigmatic effect, and so the lines look all alike. The reason they look blurred is because the focus is a circle, not a point; the greater the astigmatism the larger the diameter of the focal circle; when the astigmatism is very small, say 0.25 or 0.37, the diameter of the focal circle is so small that one hardly notices any blur.

This simple experiment seems to me very significant. If one grasps it clearly he has mastered a large part of the problem of how the eye behaves toward its astigmatism. The eye shifts the focal interval forward or back by accommodating or relaxing so as if possible *to get that part on the retina which will give the best image*. There has been much difference of opinion as to the part preferred by the eye, Javal and others saying the eye prefers a focal line on the retina, and especially the vertical focal line, so as to get clear images of vertical lines. Hess and others declare that the focal circle is the choice, while Raymond maintained that the eye shifts rapidly forward and back from one focal line to the other. Javal and his followers base their opinion on personal observation, as several of them were astig-

matic in high degree; Hess bases his views largely on camera experiments with weak cylinders. I suspect that both are in part right. With high astigmatism the patient prefers a focal line on the retina; with low astigmatism he prefers the focal circle. That he habitually makes a practice of incessant shifting from one focal line to the other is, as Souter says, entirely beyond the range of probabilities.

Unless there is some way to avoid the disturbing effect of accommodation it is obvious that the astigmatic charts will be a failure. The way to escape this snare has often been pointed out and was emphasized by Green in 1867 as also by Javal, Bull and others. One can either try to paralyze the ciliary muscle by cycloplegics or he can try fogging. The object of fogging is to induce the eye not to accommodate. Conditions are so arranged that accommodation will not help matters, but only make them worse; that is, the patient is made to wear a stronger convex or weaker concave sph. than would be selected for best vision and this is made just strong enough so that *the whole of the focal interval is kept in front of the retina*. When that is done he cannot neutralize any of his astigmatism by further accommodation; indeed he cannot accommodate at all without increasing the blur. It is of great importance in refraction work to offer every inducement to the eyes to relax their accommodation and to avoid everything which might by any chance encourage accommodation.

What shall we do in the case of the second contingency mentioned above, namely, when the patient fails to see any difference in the lines even though they are *not* all alike in the image on his retina? This is solely a matter of defective observation (for we are not considering cases with opacities of the media, retinal diseases, and the like) and nine times out of ten it can be remedied by a few minutes devoted to training the patient to see what is wanted. Place a -0.50 or a -1 cyl. before his fogged eye and ask him if he now sees any difference in the lines. If not, suggest that certain lines ought to be seen clearer—the vertical if your cyl. is held axis vertical; quickly change the cyl. to axis horizontal and ask if he does not detect the difference when you shift it. Do the same with oblique axes. If he notices the difference then try a weaker cyl. If he promptly and correctly detects the difference in the lines with the -0.25 cyl. which ever way you hold the axis, but does not detect any difference when no cyl. is held before the eye, you know that he has less than 0.25 astigmatism because he has shown that he can be counted on to recognize as small an amount as 0.25 promptly and

correctly at any of the four principal axes. (When trying as weak a cyl. as 0.25 or 0.12 the fogging should be slight, say $\frac{6}{8}$ if his vision is $\frac{6}{5}$.) If he does not detect the difference with a -1 or -1.50 cyl. after one or two minutes' trial it is rarely worth while to waste much time with this test or any subjective test and you will pretty surely have to rely on the objective tests.

The answers given by patients do not always fit our idea of what is correct and proper. It may be worth while to consider some of these confusing or anomalous answers. What should be our attitude toward these often irritating replies to our questions? It is fatal to adopt the point of view that the patient is a fool and does not know what he sees. Occasionally no doubt this is true; occasionally the patient is so dull or so poor an observer that he fails to detect or to describe very obvious things.



Fig. 4.—Appearances of a point of light as seen by observer, L, with the following sph. lenses: $+2$, $+1$, 0 , -1 , -2 . Compare Figure 1. The letters refer to the same relative parts of the focal interval in both Figures.

More often the trouble is with the examiner who fails to allow or provide for certain complications or difficulties. The patient's vision may be defective, either congenitally or from opacities or other trouble; his astigmatism may be irregular to an unusual degree. Most important of all, he may not understand what is wanted, he may not know that the fogging is intentional, or the fogging may not be so managed as to bring out most conspicuously the phenomena we are after; he may become tired and confused with what seem to him aimless and contradictory questions. The activities of the accommodation may be the stumbling block, but even with cycloplegia or apakia we may receive very confusing answers. Let me repeat that the test is not suitable for all cases.

Patients will sometimes say that there are two sets of lines which are clear and those between are blurred. For example a group of lines at 45° and another group at about 135° , both equally clear and the others less clear. Or the lines 30° and 40° clear, 50° blurred and 60° clear or other similar violations of the

rule that the meridian of clearest focus is always at right angles to the meridian of most blurred focus, while the intermediate meridians shade off from one to the other. This rule certainly holds good for refraction according to the conoid of Sturm, but the eye is never so diagrammatically constructed as to refract a pencil of rays in exact accordance with that classic and simple geometric form. Gullstrand has even gone so far as to say that the true path of a pencil refracted by an astigmatic eye does not bear the remotest resemblance to the conoid of Sturm. We may call this the exaggeration of emphasis, for it is perfectly clear that it is only in so far as the refraction by the eye *does* follow the path of Sturm that we are able to correct its astigmatism at all. Our means of correcting astigmatism consists in the use of cylindrical and spherocylindrical lenses. The path of a pencil refracted by such lenses, in the low powers most frequently employed, is very closely that of the conoid of Sturm. The astigmatism of the eye may be analyzed into two portions, one which is so geometrically regular that it can be corrected by our geometrically regular lenses and a remainder which cannot be corrected by any lenses at our disposal. It is the object of our examination for glasses to separate out as large a portion as it is possible for glasses to correct, leaving as small a remainder as possible. It is one of the chief advantages of the test by the radiating lines that it does this very thing—separates the maximum correctible portion of the refractive errors from the incorrectible remainder. The test by the point source of light, however, and in a less degree the test by skiascopy, bring out much more. If we make use of the point source to throw light on the anomalous answer referred to above (Figure 4) we shall find that the focal circle often has the form shown in Figure 4, E. Instead of being a circle it is a four-pointed figure and we can see how, when this is on the retina, two sets of lines at right angles to each other might seem the brightest and clearest. In other cases we find the focal line ending in two slightly diverging prolongations, such as would explain the clear 30° and 40° lines and 60° and 70° lines with the 50° lines less clear between.

Another perplexing thing is to find that the patient gives one axis with one degree of fogging and another with a different degree. For example, with a $+1.50$ sph. a patient might say the best meridian was 20° ; with a $+1.75$ sph. he might say 30° . Such a finding is not uncommon. It is another example of how far the eye departs from the geometrical form of the conoid of Sturm. We can explain it by the findings in some cases with

the point source test. As we cause different parts of the focal interval to fall on the retina the major axis of the ellipse may vary in its direction. Which axis shall we adopt for our prescription? It is not always easy to tell—usually the one selected with the weaker fogging. A good plan is to verify and decide by the visual acuity test, namely, by trying the cylinder at different axes with the test letters and choosing the one which gives the best vision. Or starting at the approximate axis, rotate the cylinder slowly to the right until it begins to blur, then start again and rotate to the left until it begins to blur, the mean of these observations will be the true axis, but several trials will be necessary. Objective tests are likely to help.

When a patient is fogged a minus cylinder will make clearer the lines parallel to its axis while a plus cylinder will make more blurred the lines parallel to its axis. As we are nearing the completion of our tests and the fogging is reduced to get the maximum visual acuity we sometimes find if we try a weak cyl. to verify or correct our earlier results that a minus cylinder will make the lines at right angles to its axis clearer instead of those parallel and a plus cylinder may make more blurred the lines at right angles to its axis instead of the lines parallel to its axis. The cause of this confusing answer by the patient is that we have allowed the focal interval to get back so that the posterior focal line is no longer in front of the retina, the whole interval may perhaps be behind the retina. The reply of the astronomer patient mentioned above is an illustration of this. She said the horizontal lines were clearer when a -0.62 cylinder axis vertical was placed before her eye. As there was no fogging and no uncorrected astigmatism before the cylinder was put on, the focus was on the retina and there was no focal interval. What the cylinder did was to produce a focal interval, one end of which, the anterior, was still on the retina while the other was behind. With the weaker cylinders up to -0.62 the eye found it to its advantage to handle this problem in one way, with stronger cylinders, -0.62 and over, in another way. With the weaker cylinders the eye accommodated enough to move the focal interval forward until the interfocal circle was on the retina. This eliminated the astigmatic effect, but made a slight blur, a little less than one half as much as the sphere of the same strength would make because the focal circle was a little less than half way from the anterior focal line back toward the posterior focal line, and so the amount of accommodation required was a little less than one half the strength of the cylinder.

With the stronger cylinders the eye found it to its advantage not to accommodate. The result was to leave the anterior focal line on the retina, representing the emmetropic meridian, while the posterior focal line representing the minus cylinder was behind the retina. Therefore, with a minus cylinder axis vertical, the anterior focal line (horizontal) would be clear, the posterior (vertical) would be blurred.

On the other hand, when the eye is fogged the effect of a minus cylinder is to move back the posterior focal line toward or perhaps beyond the retina. If beyond, the accommodation will be able to move it forward enough to make it fall on the retina. Therefore, with a minus cylinder axis vertical the posterior focal line, which would be vertical, would be nearest the retina and therefore clearest; the anterior focal line (horizontal) would be farther in front of the retina and so more blurred.

Thus whether a minus cylinder axis vertical will make the vertical or horizontal lines clearer depends on whether the posterior or anterior focal line is nearer the retina. It ought always to be the posterior which is nearer and it is better for it to be in front than behind. In other words the eye should be fogged and it is better to have it fogged enough so that the posterior focal line is on or in front of the retina, not behind. The nearer the retina the posterior focal line is, provided it is not behind it, the better. I have spoken of this at length and in tedious detail because it is impossible to use the test successfully unless this matter is so understood and so made a part of the technic that one instinctively and automatically avoids this pitfall. Moreover, it does not seem to be found in any of the textbooks.

Patients often say that some of the lines look double. This is the commonest form of monocular diplopia. It is less common for more complicated objects, such as letters, to look double to one eye. The cause is similar for both lines and letters. It is of interest to recall the various explanations offered. Monocular diplopia was attributed by Stelwag to polarization of the light, by Charcot to hysteria, by Leroy to fatigue of accommodation, by Bull to differences in the refraction of different sectors of the lens, by others to incipient cataract. Donders, Helmholtz and others showed how the appearance of a point source seen by the eye would explain this. Verhoeff applied the same explanation to glass lenses (*Archives of Ophthalmology*, 1900). As knowledge of this is still far from general, it may be well to repeat

it briefly. It depends on spherical aberration. In ordinary positive aberration the rays refracted by the peripheral portions of the lens come to a focus nearer to the lens than the rays refracted by the central portion (Fig. 5). If a screen is placed nearer the lens than the principal focus the diffusion circle shows

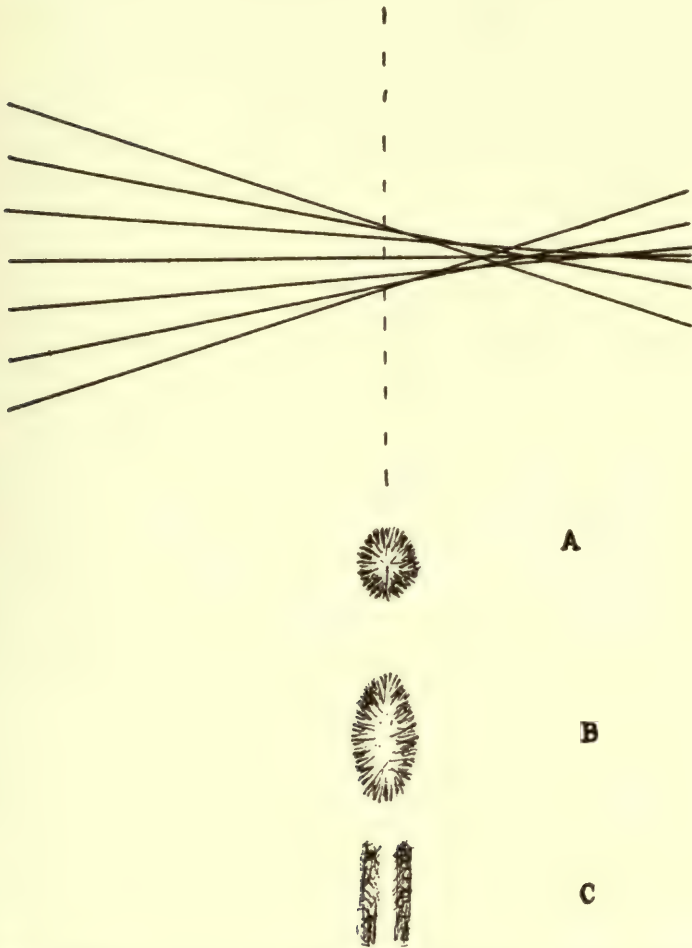


Fig. 5.—Shows how monocular diplopia may be produced in a lens with spherical aberration if a cyl. lens is added. See text for explanation.

a considerably greater amount of light near the periphery than near the center A. If a cylinder were added to the sphere this circle would become an ellipse with center less bright than periphery B. The result would be virtually two bright bands (the two long sides of the ellipse). Figure 6 shows a photograph taken by removing the camera lens, which is, of course, more or

less corrected for spherical aberration and so would not show phenomena dependent on spherical aberration, and substituting a spherical lens from the trial case with a cylinder to produce astigmatism and focusing so that the plate (corresponding to the retina) was nearer the lens than the principal focus, equivalent to placing a minus sphere and cylinder before the eye. Not only are some of the radiating lines double, but letters show distinct doubling. The three vertical lines of the astigmatic cross are doubled just enough so that the two adjoining ones overlap making two vertical lines as black as the three unblurred horizontal lines, as already explained when discussing charts.

It may be well to say a few words about the way our photographs were taken with a camera made astigmatic. In the previously published photographs of this kind, namely, those of Bull, Hess and Verhoeff, no effort seems to have been made to get anything more than qualitative results. The photographs show *how* astigmatism affects the character of the image but not *how much*—they are not quantitative. Thus Hess shows photographs in which a 0.25 cylinder produced so much blurring that print of an ordinary book was practically illegible though, of course, a far greater astigmatism is necessary in the eye to produce as great an amount of blur. All the pictures greatly exaggerate the appearances as seen by the eye.

In making these photographs I was guided in two ways in my attempt to secure results tolerably correct quantitatively as well as qualitatively: 1. Camera effects were compared with the *subjective* effects of cylinders. 2. Calculations were made of the amount of blur produced in an eye by an astigmatism, say of 1 D., and then calculation made of the proper arrangement of the camera to produce an equivalent amount of blur. These calculations may be worth recording, as they show how far from quantitative are the results given by the above-named observers.

In Figure 7 p = pupil, r = retina, f = focus, d = diffusion circle (or line) on the retina. The size of the diffusion circle depends on (1) the size of the pupil; (2) the distance of the retina from the focus, that is, $d:p = b:a+b$. Let us get the numerical values of these letters: a is the distance of the pupil from the retina—more accurately, the distance of the pupil of exit, which is slightly posterior to the true pupil or iris, being the image of the pupil as seen from the retina through the crystalline lens, just as the pupil of entrance is the image of the pupil as seen through the cornea—this distance may be taken

as 19 mm.; b is the difference in the focal length with and without the -1 cylinder. The posterior focal length of the eye (posterior principal point to retina) may be taken as 21 mm.; Helmholtz gives it as a little less, others as a little more; 21 mm. = 47.61 D. This is without the -1 cylinder. With the -1 cylinder the focal length in 1 meridian would become $47.61 - 1 = 46.61$ D. In millimeters this equals $1,000 \div 46.61$ or 21.45 mm. Thus b , the difference between 21.45 and 21, equals 0.45 mm. In other words the posterior focal line is 0.45 mm. behind the retina. The expression, $b : a + b$, becomes $45 : 1945$, which reduced equals $1 : 43$ (strictly 43.22). We may take p , the diameter of the pupil of exit, as 4.3 mm. The equation, $d : p =$

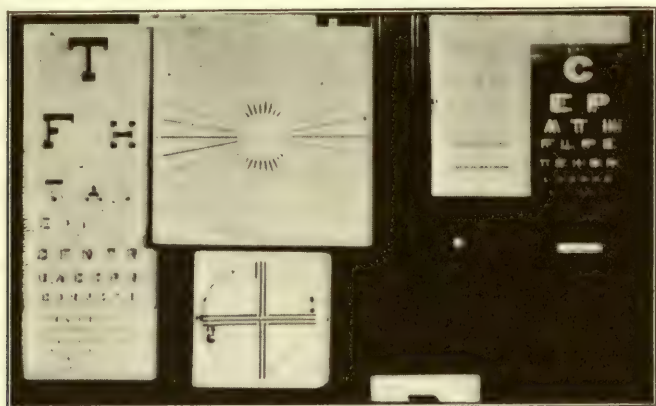


Fig. 6.—Monocular diplopia imitated in a camera.

$b : a + b$, becomes $d : 4.3 = 1 : 43$; d is thus 0.1 mm. That is, a -1 cylinder before the eye (with no accommodation and a pupil of 4.3 mm.) may be expected to produce a diffusion line in one meridian 0.1 mm. long.

In the case of the camera we may take the lens as 6 D. (only in a very small camera would it be more); with a -1 cylinder it becomes 5 D. in one meridian. Thus $a = 166.66$ mm., $a + b = 200$ mm., $b = 33.33$ mm. $b : a + b = 33.33 : 200 = 1 : 6$. Therefore, diffusion line is one sixth the diameter of the aperture (or pupil) of the camera. In the experiments of the authors mentioned above, the aperture was probably over 20 mm., giving a diffusion line of over 3 mm., thirty times as large as in the eye. We cannot compare the size of the diffusion circles except on a basis of size of images. If the image is thirty times as large the diffusion circle may be thirty times as large with practically the

same blur. With a given distance of object, the size of the image depends only on the distance of the image from the nodal point. We may take the distance of the posterior nodal point in the eye as 16.67 mm.; in the camera as 166.67. The image in the camera would be ten times as large as in the eye. With a diffusion circle or line over thirty times as large, instead of ten times, the blur is, of course, greatly exaggerated. To remedy this we have only to reduce the size of the aperture of the camera. Since the image in the camera is ten times as large as in the eye, the diffusion circle should be ten times as large. In an eye with -1 D. and a pupil of 4.3 mm., we found the diffusion circles to be 0.1 mm., therefore they may be 1 mm. in the camera to be comparable to such an eye. As the diffusion circles in the camera are one sixth the size of the aperture, the aperture must be 6 mm. to give a diffusion circle of 1 mm. As a matter of fact, we used a little smaller aperture for we reckoned on a pupil a little less than 4.3 mm. I used the above numbers here to make it easier to follow the calculations.

By way of summarizing the important points in testing astigmatism by astigmatic charts, I propose to give some concrete examples of the clinical use of this method.

A. B., aged 47, increasing symptoms of eyestrain, not relieved by $+1$ spheres for near, which he obtained elsewhere. Does not do much near work; leads active life with considerable responsibility and nervous strain as manager of a business whose magnitude, though not large, has rather outgrown him. Such a hypermetrope is apt, more than most younger patients, to show a tendency to spasm of the accommodation. Presbyopia has asserted itself for near, but the patient still has perfect vision for distance, and accommodation is making a determined struggle to maintain it. Having taken history, also vision without glasses ($6/5+$), we make the external examination by daylight. This shows nothing significant except rather largish pupils for his age. This speaks against spasm of accommodation because overaction of the ciliary muscle is usually associated with overaction of the sphincter of the pupil, but *it speaks for greater effect of any errors of refraction because they are not minimized by a small pupil causing small circles of diffusion*. Hence, if possible, greater care should be used in correcting the refraction.

The room is now darkened. Focal illumination shows nothing abnormal. Ophthalmoscope shows fundi normal except possible hyperemia, a diagnosis which should be made with caution. Media clear. Refraction hypermetropic; no considerable astig-

matism. Brief glance with retinoscope shows H. over 1 D. in horizontal meridian, near 1 D. in vertical meridian; axis slightly to temporal side in each eye. With the room still dark, except for a shaded light over the trial case and table, memorandum is made of the data so far discovered, while the patient with his eyes closed recovers from any dazzling effect of the ophthalmoscope and retinoscope; also his accommodation continues to relax, one of the most powerful means of accomplishing this being to shut the eyes in the dark. The ophthalmometer is not used in this case, as the astigmatism is small and it is not probable that any valuable information will be obtained.

+2 sph. O. U. in trial frame is placed on patient, eyes still closed. Light is now admitted and patient, being allowed to open eyes, is asked to read what he can of the letters with these blurry glasses, which he is told are not intended to allow him

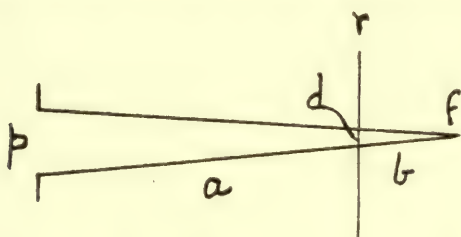


Fig. 7.—p=pupil, r=retina, d=diffusion circle on the retina, f=focus when the —cyl. is before the eye, b=distance of this focus back of the retina, a=distance of retina from the pupil (pupil of exit). $d:p::b:a+b$.

to see much. He reads down to 6/12—. Covering first one eye and then the other, I ask which sees better and note a slight movement of redress when the cover is shifted showing some esophoria. He says left is a little better and expresses surprise, as he thought right was better. I explain that it is because of the glasses that right is not seeing as well at present and make a mental note that right is probably less ametropic and so sees better ordinarily while now it sees less because +2 overcorrects it more than it does the more hypermetropic left. Opaque disc is placed over the left and patient reads 6/16—. With so small an astigmatism, this is overfogged, and while he closes his eye I change to +1.75 sphere and he reads 6/12+. He is now asked to look at the chart with the many radiating lines like spokes and to notice whether all the lines look alike or some are darker and more distinct. He says all are blurred; he sees none clearly; all are alike. A —0.50 cylinder is held in front of the

eye with the axis vertical and he is told that now some are darker. He notices that the vertical are. Cylinder is removed and he still sees vertical darker. Cylinder held horizontal he sees all alike. Cylinder removed and I go to the chart and ask him to tell me as I point which line is darkest. After a few trials he indicates that 80° , 90° , 100° , 110° are the four darkest lines and that they are about equal, 90° and 100° being a little darker. I look carefully at his head and note that it is still held straight and square as I fixed it before going across the room. I decide axis O.D. is 95° and set the chart with the black cross at that angle. To the question which is blacker he says the up and down line. I place a -0.50 cylinder axis 5° in the frame with the $+1.75$ sphere and he says the two lines are alike. He reads $6/8+$, which shows that he is fogged about right. A -0.25 cylinder held axis vertical makes the vertical lines blacker; axis horizontal makes the horizontal blacker. With a -0.12 cylinder axis vertical, he says all are alike; with axis horizontal he says "all are alike—no, horizontal are darker." Repeated trials fail to catch him. He answers consistently, when -0.12 cylinder is vertical all are alike, when horizontal the horizontal lines are clearer. I infer that the 50 cylinder slightly overcorrects his astigmatism, for when I add 12 to it making 62 cylinder he detects the overcorrection, but when I hold the 12 cylinder axis vertical, thus reducing the 50 to 37, he does not detect the undercorrection, but only when I hold a 25 at that angle. I record astigmatism as $+0.50$ cylinder ($+0.12$, -0.25) axis 95° .

I now try the left eye. Having had experience with the right eye he notices at once with a $+2$ sphere that the vertical lines on the wheel are darker. He reads $6/12-$ on the letters. I go to the chart and he indicates that 70° , 80° , 90° are the darkest lines. I note that head is not tilted and place the cross so that one axis points to 80° . I record axis as 80° . -0.50 cylinder is next placed in the frame axis 170° . He says (being now a better trained observer in what I am after) "that is much better, but vertical line is still slightly darker." Holding -0.25 cylinder axis horizontal before the eye, thus increasing the -0.50 to -0.75 cylinder, he says the horizontal is now slightly blacker than the vertical. I change the cylinder in the frame to -0.62 axis 170° . He sees no difference in the two lines, both equally black. He reads $6/6-$, showing slight fog, enough for a test with -0.12 cylinder. Holding this first axis vertical, then axis horizontal he always detects which way it is held by seeing that meridian darker. I record: $+0.62$ cylinder (± 0.12) axis 80° ,

meaning that if 62 cylinder is increased or decreased by 12 he detects it. That is, as the eye is at the present moment, a 62 cylinder corrects the astigmatism with an error of less than 12. I now ask him to shut the eyes and I place in the frame: O.D. + 1 sph. $\ominus$ +0.50 cyl. ax. 95°, O.S. + 1 sph. $\ominus$ +0.62 cyl. ax. 80°. With both eyes open he now reads 6/5+. I cover right and left alternately and he says left is better than right. After changing the sph. O.D. to +0.87, he says both eyes are alike and very clear. With +0.25 sph. held before both eyes at once, he reads 6/8+: with -0.25 sph., he reads a few more letters than without (so would an emmetrope). I record as his full correction: O.D. +0.87 sph. $\ominus$ +0.50 cyl. ax. 95°, O.S. + 1 sph. $\ominus$ +0.62 cyl. ax. 80°. As he has not been wearing glasses for distance I suspect that a weaker pair than the full correction will be better for the first pair and will doubtless give great relief, I therefore order O.D. +0.75 sph. $\ominus$ +0.50 cyl. ax. 95°; O.S. +0.87 sph. $\ominus$ +0.62 cyl. ax. 80°, directing him to report in a month. After he has worn these a month or so his eyes will have relaxed and probably will give a different result in some slight respect. If I made several tests now including one under homatropin or atropin, I should not be able to tell just what the test a month or two hence would show, not even if I kept him under atropin for several weeks. Only by having him wear approximately his full manifest correction for a sufficiently long period will the eyes settle down, so to speak. Then we can readjust our correction with greater precision than can be attained in any other way and with far greater comfort and freedom from annoyance to the patient. It is important to realize that in the case of a small error like this we cannot expect that the results of repeated examinations, even at short intervals, whether with or without cycloplegia, would give *identical* results. If you will try to measure to a millimeter the focal lengths of two or three weak lenses by measuring the distance from lens to clear image on a screen, object being at known distance on other side of the lens, you will find that you cannot be sure of the distance at which the image is sharpest to within a millimeter—not even to a centimeter. Even more variable would be the findings of a series of observers. If they tried to measure the length of a given lead pencil to the hundredth of an inch, their results would also vary. Now, fortunately, it is not usually necessary that the results should be so exact and consistent. In the majority of cases, as every one knows, one might order any one of half a dozen different formulas with benefit,

but I do not go so far as to say with *equal* benefit. Now and then it seems to make more difference, probably because of hypersensitiveness of the patient from one or more causes. And nearly all will agree that the nearer you try to come to exact measurement the smaller your average error will be in the long run. In this hypothetical case outlined above, if one had ordered 50 cylinder in each eye instead of O.D. 50, O.S. 62, he would have given the patient great relief. Had he made axes 90° in each eye instead of O.D. 95° and O.S. 80° , he would have had excellent results. If he had used any strength of sphere from 0 to +1 to combine with his cylinder he would have helped his patient, but less in each case than with the formula selected above. He would come back sooner with recurrence of symptoms. This opinion is based on experience, but it is of course only an opinion, not a proved fact.

Let us measure our patients with as great precision as possible and spare no pains; but let us be honest with ourselves and not suppose we are more accurate than we really are or that whoever differs from us is wrong, or that by using a cycloplegic all error will be eliminated.

Astigmatic charts excel where the astigmatism is of low degree with good visual acuity in intelligent patients—just the most common and important type of patient in private practice. No other test is nearly as accurate in cases of this class. Precisely the class of patients where a small departure from the best correction produces most trouble.

In patients of poor powers of observation or with high astigmatism or poor visual acuity other tests excel, especially skiascopy. Incidentally the proper method of applying the test leads to an unmasking of considerable hypermetropia which might otherwise remain latent.

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DISCUSSION

DR. EDWARD JACKSON, Denver:—The literature of astigmatism reveals a large number of possible subjective tests, all of which are interesting and all of which are practical to varying extents. The problem for each of us is to select the ones that give the most reliable results. For a good many years I used the astigmatic chart; but largely gave it up after becoming thoroughly familiar with the shadow-test, for it seemed to me I could get more out of the time at my disposal by using the objective test; and then making the subjective test with the cylindrical lens and test type.

Dr. Lancaster has emphasized a point in the use of the astigmatic chart and all similar tests that is of the highest importance for accuracy. That is that the retina must be outside the focal interval, both focal lines

in front of the retina or both back of the retina. If no cycloplegic is used you should have both focal lines in front of the retina by use of a sufficiently strong convex lens in front of the eye. The variation of this test that I find of most value is the use of a single set of lines that can be turned in any desired direction. I commonly employ the three parallel letters, a little larger than the one-minute angle. By using the one set of lines we escape the psychological difficulty of getting the patient to concentrate on one thing, and then seek what spherical lens would make these lines most clear. The advantage of this plan over the stenopaic slit is that you use the whole of the pupil and get results that hold when the patients use the whole.

THE USE OF OPTOCHIN IN EXTERNAL EYE DISEASES, EXCLUDING PNEUMOCOCCIC INFECTIONS

JESSE S. WYLER, M.D.

CINCINNATI

Optochin is a preparation put on the market by the Vereinigte Chinin Fabrik of Frankfort a/M. as a chemotherapeutic agent for those pneumococcic infections taking the form of serpigenous ulcers and conjunctivitis, and for disinfecting the conjunctival sac, preparatory to operating. This drug is a derivative of quinin and synthetically is hydro-ethyl cuprein put up in a basic form or as a hydrochlorid. I personally have had my experience with the latter form as I have not been able to obtain optochin basicum. There is no novelty in the use of this preparation, as many articles have appeared dealing with its efficacy in the treatment of corneal ulcers quoting quite favorable results. But it is not within the scope of this report to dwell on the original use of this agent, rather to relate my experiences, good and bad, in the treatment of other external diseases.

In the *Klin. Monatsbl.*, September, 1914, appeared an article from the Stanculeanu Clinic in Bukarest with the report of eight cases of gonorrheal ophthalmia treated with optochin, and so favorable were the results that that paper was really the incentive in attempting its use in various conditions. "It was found that with this treatment absolutely no irritative or intoxication symptoms were manifested, that the children nourished nicely and showed no constitutional changes. All the cases were clinically cured long before the gonococci disappeared from the smears, so that only a bacteriologic examination could give positive information. They believe that all ophthalmologists must agree that a *maximum of fourteen days* to cure the severest cases is a most wonderful performance. Corneal ulcers and infiltrations not only showed no progress, but even the advanced cases were markedly improved. Thus this drug is far superior to silver nitrate and has the practical value of not needing the services of a doctor for its administration."

During the interval in which I was working up my cases an article¹ from the clinic of Prof. Grünert of Bremen upon the same subject appeared. The author divided his cases into (1) pneumococcic conditions, (2) diseases of the tear sac, (3) cases in which photophobia was a marked symptom. His conclusions in the first group show that the earlier optochin is used, so much better is the prognosis and that the end results are superior than after the older method. Personally in bad corneal ulcers I prefer cauterization.

As a substitute for tear sac extirpation, irrigations of optochin will never succeed, but in slight infections or in acute varieties success frequently follows. The chief advantage was found in those cases with marked photophobia or in scrofulous inflammations. It was astounding how rapidly conditions of long duration were overcome. Two of his cases of parenchymatous keratitis gave no results, and as I shall show later in my case reports, I had exactly similar experiences. The use is also contraindicated in lime burns. The action of optochin in these cases of photophobia is not due to its anesthetic quality as maintained by Peterka, for cocain which acts more vigorously and over a longer interval does not show nearly the same effect.

Gebb of Greifswald investigated the germicidal action of optochin experimentally and found that a 2 per cent. solution kills pneumococci in a test tube at once, 1 per cent. in five minutes and a 0.5 per cent. not at all. In drop dose experiments the germicidal value is not worth mentioning. In the eyes of rabbits a 1 per cent. optochin proved much more effective than oxycyanid of mercury. We must, however, bear in mind that clinical and test-tube experiments show wide variations, especially in ophthalmic medication. Years ago Roemer showed that eye medicaments acted not by direct germicidal effect but by the production of antigens and antibodies. We know that it takes a 1:1,000 bichlorid solution over ten minutes to kill staphylococci. Now if a solution of this strength be instilled in the eye, how long would it take to become a multidilution and how long would even a trace be discoverable in the conjunctival secretion? All our drugs, excepting those forming albuminates, work only by indirect action, and thus it must be with optochin, hence the inhibition or destruction of cultures in a test tube matters little providing the clinical end results are satisfactory.

1. Ueber die Anwendung von Optochin bei verschiedenen äusseren Augenkrankungen Stengele, Klin. Monatsbl., May, 1915.

I have treated the following cases with optochin and shall give the clinical reports of all, in brief, excepting the gonorrheal histories upon which I desire to lay special emphasis as the most important part of my information:

Two cases of gonorrheal ophthalmia.

Two cases of interstitial keratitis.

Two cases of vernal catarrh.

Three cases of phlyctenular disease.

Three cases of trachoma with pannus and ulcer.

CASE 1.—Dr. Z., aged 30, reported at my office September, 1914, having suffered since spring with terrible itching of the eyes and much clear stringy mucus. Had been treated by several colleagues with all recognized metallic and astringent preparations, but no results. The tarsal conjunctiva was covered by a typical bluish haze, while the bulbar mucous membrane, especially on warm days, became highly congested. I ran through my list, but adrenalin and novocain alone brought relief. As the cold weather approached the condition improved and it was not until May that I saw him professionally, with the same symptoms. I advised radium, but it was refused and as a last resort prescribed a 1 per cent. optochin every two hours. Imagine my surprise, when at the end of a week the patient reported absolute comfort from the itching and he has continued to use his preparation when necessary through the entire summer with perfect relief.

CASE 2.—Mrs. M. M., aged 46, had repeated attacks of itching and red eyes for the past five summers. Reported to me with the first warm days in April. Eyes are red and around the limbus are several indistinct nodules. I ordered 1 per cent. optochin three times daily and saw the patient weekly for a month and finding that she had absolute relief, discharged her until further trouble.

These are two mild cases of vernal catarrh which responded to this new therapy and I hope to try this preparation in every case of like nature.

CASE 3.—Mary Mc., aged 11, was treated by me seven years ago for trachoma in the cicatricial stage. She now reports at the office with a thick pannus crassus covering the entire left cornea, marked epiphora and photophobia. I brushed with 2 per cent. silver, but as she lived in Kentucky and could not come regularly for treatment I ordered 2 per cent optochin every three hours. At the end of two weeks, there was a tremendous improvement and after six weeks the blood vessels on the cornea were scarcely perceptible, with a visus of 6/12.

CASE 4.—H. D., aged 40, at the General Hospital with a large leucoma adherens O. S., while the right eye had a marked entropion of the upper lid from a third-stage trachoma with a central corneal ulcer surrounded by maculae. Visus 15/70; opto-

chin (2 per cent.) instilled every three hours with relief from pain and gradual diminution of the ulcer. After ten days' treatment, a Hotz operation corrected the distorted lid. The steady improvement noted before the operation continued until, four weeks after admission, the patient was discharged with an acuity of 15/24.

CASE 5.—A colored man of 35 years of age with ectropion and trachomatous pannus. The lids were corrected by the house surgeon and optochin (2 per cent.) used every three hours. He slowly improved until his vision rose from 1/10 to 3/10.

We find in these three cases of trachoma a marked improvement, all of them responding nicely. However what proportion of benefit was derived from the lid plastic is a debatable point. My only reply is that betterment had already started before the operations were attempted and the *drug seems applicable to cicatricial stages of trachoma even in stronger solutions* than I dared use, as the tissues are extremely resistant in these much handled victims.

CASE 6.—Mrs. C. G., interstitial keratitis from acquired lues was treated for two months with optochin and showed absolutely no results, the vision remained the same in both eyes. This, however, was a case of long standing and was practically stationary when the drug was ordered.

CASE 7.—M. A., 13-year-old girl on hospital service, active inflammatory condition, both eyes, positive Wassermann, a typical congenital infection. Optochin seemed to produce more congestion and was decidedly painful, so after several weeks we stopped this therapy.

The conclusion I must draw from Cases 6 and 7 is that optochin is contraindicated in parenchymatous keratitis, especially since Stengele, the only other writer I can find who attempted its use, met with like results.

We next pass to the phlyctenular inflammations, with photophobia, lacrimation and other classic symptoms. Of this variety I treated three, two of which, Cases 8 and 9, had corneal involvement and one, Case 10, merely conjunctival phlyctenes. All the cases were in children and were treated with Y. O. 10 per cent. at the office and 1 per cent. optochin at home three times daily. *They were all influenced most favorably,* but sufficient time for recurrence has not elapsed. Again I must agree with Stengele in finding a most rapid disappearance of photophobia. Since recording these three cases I have treated two adults at the hospital with similar favorable results.

I now come to the most important but at the same time depressing part of my paper, in which I wish to fully describe two unfortunate terminations in gonorrheal ophthalmia.

CASE 11.—Infant H., was 7 days old when admitted to the hospital service. Mother and father both denied infection and examination was negative. A practical nurse had assisted the doctor at confinement and the Credé prophylaxis was used. Three days after delivery the doctor noted pus in the baby's eyes and a fully developed ophthalmia.

On admission large quantities of thick creamy pus oozed from between the tremendously swollen lids. A very marked chemosis was present. Corneae were clear. Two slides contained numerous gram-negative diplococci.

The treatment of the Stanculeanus clinic was instituted, flushing with permanganate 1:10,000 hourly, followed by alternating 1 and 2 per cent optochin.

The following day, July 2, secretion slightly less; July 3, irrigations changed to chlorin water 3 i-3 vi half hourly with the optochin hourly. There was a steady improvement with occasional remissions, the chemosis almost disappeared and the eyes remained free from pus for two-hour intervals. Baby opened eyes on the 7th and doing nicely. On July 9 I made a careful examination and found everything as it should be, and left on my summer vacation, much elated over the therapy.

The following notes together with the other hospital reports are from Dr. Merrick McCarthy, the efficient ophthalmic house surgeon, whom I desire to thank for his kindly assistance and earnest work.

The evening following my departure Dr. McCarthy noticed a slight cloudiness on the lower sclerocorneal margin of *both eyes* which seemed to be spreading upward, although there was little swelling and discharge. The optochin was stopped and nitrate of silver applications 2 per cent. applied daily with flushings of boric acid half hourly.

July 11, much pus and entire corneae of both eyes opaque. No gonococci found at this time. Despite the united efforts of staff and houseman the case ulcerated and perforated ten days later.

I have given this case much careful thought and although I did not see the corneal condition, must say that it does not seem to me to have been of gonorrhoeal origin for several reasons.

1. Corneae are seldom involved when the case is regressive, little pus and eyes open.

2. Both eyes are not affected simultaneously.

3. Within twelve hours of the onset both corneae were completely destroyed.

The general condition of the child was reported poor. Could it have been a keratomalacea, such as I saw years ago in the Vienna clinic following a birth infection? I personally saw only a steady improvement in the case. I am glad to say that the baby retains good vision in one eye at present.

CASE 12.—A white male, 19 years old, contracted urethral gonorrhea fourteen days before admission. Nine days later the right eye became infected and was treated by a general prac-

itioner until sent to the hospital by a consultant July 2. The right eye cannot be opened because of the swelling. Much thick yellow pus and, on separating the lids, a blood-stained chemosis present. The cornea is completely opaque, denuded of epithelium, tension minus, vision qualitative. Left eye not involved. Treatment was permanganate flushings followed by 1 and 2 per cent. optochin solutions. Atropin 1 per cent every four hours. Protective dressing to left eye. Gonococci found both in smears and cultures.

July 3. No change.

July 4. Eye irrigated every half hour; discharge still free.

July 5. Irrigations changed to chlorin water.

July 6. Secretion less. Cornea seems slightly clearer, chemosis less but tissues are still beefy.

July 7. Optochin 1 per cent. every two hours. Condition better.

July 9. The pus has almost stopped, requiring flushings only from two- to three-hour intervals. Here I left this case, and as the treatment was changed by my successor, the remainder of the history has no bearing on the question. Sufficient to say that the left eye was kept intact.

What conclusions can I draw from these two gonorrheal cases from which I expected so much when I left the city? My observations only showed the advantageous use of the optochin, but the subsequent history of the baby causes me to hesitate in my enthusiasm. That the drug itself is never harmful must be granted after its use in thousands of eyes, but the brilliant results of Puscariu are wanting. *Although the symptoms diminished rapidly in both cases, I had no opportunity to study the terminal effect.*

I have put forth honestly the results of these few cases, not to lay down any fixed rules for the use of ethylhydrocuprein, but only to make these few trials a beginning for reports from the other clinicians, so that positive or negative conclusions as to its worth may be fixed. Despite my one bad result in gonorrheal ophthalmia, I feel justified in attempting its use in similar cases, so sure am I that careful observation can prevent any untoward complications and that the blame cannot be attributed to optochin.

If repeated observations verify the Bukarest reports we surely have a decidedly simple and more efficacious therapy in Neisser infections.

DISCUSSION

DR. H. S. GRADLE, Chicago:—Like Dr. Wyler, I have had experiences, both favorable and unfavorable, with optochin in diseases of other than pneumococcic origin. A rather extensive series of experiments with this drug in trachoma was discouraging as far as results were concerned.

I have not used it in either gonorrheal ophthalmia or vernal catarrh. But it did prove most successful in several cases of xerosis conjunctivae et corneae, complicating acute trachoma in that it caused a complete disappearance of the xerotic areas and the bacilli within a few days. Upon my recommendation, Dr. Faith used optochin in a case of several months' duration of xerosis of the conjunctiva and nasal and pharyngeal mucosa that had resisted all other treatment. A complete disappearance of the xerotic areas occurred within a few weeks. I also use optochin in another class of cases, irrespective of the bacteriological findings. That is, foreign bodies of the cornea and as a prophylactic before any intra-ocular operation. We know of the dangerous pneumococci and streptococci that lurk in the depths of the transitional folds and these may be eliminated so easily by the use of this drug. Could not the lack of results, reported in certain cases by Dr. Wyler, be due to the age of the solution of optochin used? We know that these solutions deteriorate so that they lose their efficacy within six to seven days and possibly some of his failures in the gonorrheal cases might be due to this cause.

DR. WENDELL REBER, Philadelphia:—It occurs to me that if we go back into the old literature we will find that quinin salts were used in trachoma by the fathers in ophthalmic practice, and it is interesting to know that we are coming to use one of the quinin derivatives. It shows we move in circles. I have not tried it in trachoma. I have tried it in conjunctivitis in 1 or 2 per cent. solutions; also in vernal conjunctivitis. The case had run for nine years, and was a typical case with no corneal involvement. I tried the solution freshly made, with no effect whatever. In acute pneumococcus conjunctivitis I have had ideal results. Every case of conjunctivitis that comes into the office is smeared and many of them cultured. The pneumococcus cases have shown typical happy results. One per cent. solution is nicely borne and seems to be as productive of results as 2 per cent. There should be a fresh solution made every other day. I do not see what was expected to be gained in the case of interstitial keratitis alluded to, but suppose it was for experimental purposes.

DR. JOHN GREEN, JR., St. Louis:—A recent experience with a pneumococcus ulcer may be of interest in this connection. A young man with an acute trachoma had a small ulcer of the left cornea. The lids were rolled and energetic treatment instituted. The ulcer extended, and a culture showed pneumococci. I immediately ordered ethylhydrocuprein, 1 per cent. every hour, and in addition I applied a 3 per cent. solution directly to the ulcer, with a cotton wound toothpick, taking care to bring the drug into contact with the edges of the ulcer. The ulcer continued to spread, so I abandoned ethylhydrocuprein and did a Saemisch section. At once there was a gratifying change, and within forty-eight hours the ulcer began to heal. I relate this case to emphasize my belief that we should not rely too implicitly upon this treatment, but should resort to surgical measures if the ulcer continues to spread.

DR. M. WIENER, St. Louis:—This paper has interested me, because I started to make experimentation with the ethylhydrocuprein since the paper came to my notice; and since then two cases of gonorrheal ophthalmia have come under treatment, one a severe case involving both corneae. The patient came to the clinic but refused hospital admission. I prescribed 2 per cent. ethylhydrocuprein. The next day the patient did not appear. The following day I sent for the patient. The pus had stopped and there was no more pus from then on. I saw the patient seven days later and there was no discharge from the conjunctiva. There was nothing used but cold applications and this optochin. The swelling dis-

appeared rapidly and the patient was apparently well on the eighth day. The other was a patient admitted to the hospital who had every attention, including two special nurses; whether we can attribute it to the optochin I do not know, but after the fifth day there was no discharge, and no swelling of the lids. He continued in the hospital eight days after I first saw the patient. It is now two weeks since he left the hospital and there is no discharge.

DR. BISSELL, Rochester, N. Y.:—I just dismissed a case of gonorrheal infection in a patient of 25 years of age. The cornea was cloudy and had a large central ulcer. Immediately started the ethylhydrocuprein and never saw a gonorrheal infection stop with such rapidity. The smear made was loaded with gonococcus. He has practically normal vision in that eye now. The accumulation of these reports may be of value. I have used it a number of times in pneumococcus infection with fair results, but the result of this gonorrheal case seemed most unusual. I applied it as Dr. Green did with a swab to the cornea, and had the patient drop it in the eye three times a day.

DR. JOSEPH S. LICHTENBERG, Kansas City:—I apply the powder on the cotton swab to the infected area. I think it has a good effect. Better than the weaker solution.

A MEMBER:—Where is it procured?

DR. LICHTENBERG: From Merck.

DR. J. S. WYLER (closing discussion):—I thank you for your case reports and hope they may continue to come in. But I wish to state that as the subject of my paper excluded pneumococcic infection, I do not wish to answer the gentlemen who spoke of these pneumococcic infections. Dr. Gradle mentioned that the solution was unstable. However, I do not use them after ten days.

Dr. Reber says quinin remedies have been used in gonorrhea for years. The genito-urinary surgeons are using optochin and a preliminary report has been made by H. Brown of Cincinnati, in which he used it in eight cases, and claims it checks an acute case very rapidly if injected early, but finds it unsatisfactory in the chronic cases of urethritis.

I do not want to stand as a champion for optochin, but it does stop itching, and if you will give it a trial in those cases where itching is a marked symptom you will find it will act most gratifyingly.

I am glad that Dr. Wiener found that optochin stopped the secretion of gonorrheal ophthalmia. It occurred to me that this was the case, but my results were rather discouraging. In the last two weeks, however, I had a third patient, which could be termed a complicated case; a man of 35, working in lime, some flying into his eye, he immediately started to rub the lid. At the same time the man was suffering from urethral gonorrhea and he managed to rub some of the gonococcic infection into his eye. How much was lime burn and how much gonorrheal infection I am unable to state. At any rate, he had an ulcer 3 by 3 mm., and the rest of the cornea remained intact. I used optochin right through and the patient is on the way to recovery after ten days.

MASSIVE SUBCONJUNCTIVAL INJECTIONS OF CYANID OF MERCURY IN DANGEROUSLY INJURED OR INFECTED EYES

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CUMBERLAND, MD.

When Lister introduced the carbolic spray into surgical practice, the value of his contribution was not in the detailed technical procedure and chemical, for both, in time, were superseded by other procedures and chemicals; but in the broad principle of antiseptis, which has come to stay. Likewise, in my humble belief, it is not any particular chemical or dosage in subconjunctival injections that is a matter of importance, but the broad principle that by exciting by whatever means chosen, a maximum normal physiologic reaction, Nature is aided in accomplishing certain feats in resisting disease or injury, which, without this aid, she could not accomplish by such physiologic actions as she could otherwise exercise in a given time under conditions confronting her.

The bulk of what has been written on subconjunctival injections seems to have as a guiding purpose the desire to administer a drug, serum, or what not in such a manner as to avoid reaction; hence the small doses of various mercury salts and saline solutions, as usually practiced.

It seems to me this is trying to avoid the very activities we should seek to encourage. The widespread belief that it is a serious procedure, or a terrible experience for a patient, to have an eye artificially swelled shut, and perchance a somewhat swollen face, is not founded on fact, but likely based on the experience of generations that such appearances, when the result of disease, are of serious omen. In eleven years' use of this method, no instance has yet occurred in which harm can be proved to have resulted, except inasmuch as the conjunctiva is rendered adherent to the globe over a small area surrounding the needle puncture. As practically all cases in which it is used to prevent infection require only one treatment, that is a matter of no concern; and in most cases where it is repeated for treating disease, the gravity of said disease is so serious and the chance of an attached conjunctiva being an impediment to some

future operative measure so slight, it need not be considered. Adhesions do not in any way impair the healthfulness of the eye, as cases injected years ago have shown a disposition to improvement, and not decline, where any change at all took place.

The little that has been written of injections of the mercurials in liberal quantities is calculated to make one approach the subject with fear and trembling. For instance: A recent exhaustive work on injuries of the eye quotes certain authors as having observed adhesions to globe, shrinking or sloughing of conjunctiva, entropium and peculiar changes in the cornea and lens.

As set forth in a paper before the American Medical Association in 1912, the formula which has been mostly used for injection is 2 c.c. of 1:1,500 cyanid of mercury, in which is dissolved about one-eighth grain each of aconitine, morphia sulphate, dionin, boric acid and a little salt, having these latter ingredients already mixed for convenience. The eye should be cocainized very thoroughly for a longer time than usual in operations, and then the injection will cause pain very seldom lasting over fifteen minutes in an eye previously not painful. If conditions already painful, as iritis or iridocyclitis exist, one-quarter grain of morphia is used. The pain lasts longer, but when it quits it usually takes the previous pain along with it, to stay gone. Dr. Black of Denver informs me he has good results using novocain in his injection fluid, as an anelgesic. Children are given as large injections as adults. Lieutenant Colonel Smith of India is a strong advocate of massive cyanid injections, and writes that those who visit his clinic are struck by the rapid and marked results obtained in corneal ulcers, lymphatic pannus and keratitis, as well as fundus conditions. He now gives adults one-half grain of morphia hypodermically one hour before and cocainizes well at the time, to make it tolerable. He writes the younger the child the stronger the dose required to get a standard reaction.

Our present-day theories attribute great importance to serums as Nature's weapon against infections, and heterogeneous or autogenous serums are injected into the system at large for many conditions. An injection as described manufactures the serum on the spot. Some foreign investigator has used autogenous serum obtained by blistering the patient, and drawing serum under bleb into syringe for subconjunctival injection, and our presiding officer, Dr. Lamb, has had gratifying results from so injecting salvarsanized patient's serum in syphilitic diseases.

The lymph channels are also flushed by the increased lymph flow, and most likely the nutrition of various structures increased by the increase of lymph pabulum supplied. In penetrating wounds of the globe and peripheral ulcers of the cornea, the swollen conjunctiva also covers the wounds, and protects against external contaminations and conjunctival secretions. The swelling usually leaves the center of the cornea exposed, but in some cases that also is covered, where the swelling is more on the globe than in the lids. (On a certain evening, a coal miner came with an extensive hypopyon keratitis, with a small central traumatic ulcer as the source of infection.) Where a corneal ulcer is central, an immediate injection is advised to check it at once, and prevent an obstructing scar; whereas peripheral ulcers are treated by simpler established means, until they either heal or demonstrate an inability to do so. This man was given a standard injection. Next morning a medical friend was with me, and I said I will show you a patient whose eye has been injected, but will not promise to show you the eye. On removing the pad, the lids were not too swollen to open readily, but there was no sign of an eye to be seen, the conjunctiva having closed over everything, so it looked like an implantation had been done. This man was permitted to go home for a week, and on return the eye was clear of all pus and inflammation and sight practically normal. Several similar cases in miners have given the same good, prompt results.

In a symposium on "Industrial Accidents" before the British Medical Association, after the adoption of national insurance, Mr. Pooley, an eye surgeon of Sheffield, stated that notwithstanding the large number of ironworking establishments, with their varied perforating and other eye injuries, more eyes were lost by virulent hypopyon keratitis in coal miners in the district than by all those in the iron industries combined. Neither did he speak too optimistically of its treatment. In an abstract in the *Annals of Ophthalmology*, p. 564, July, 1914, from *R. Clinica Oculistica di Roma*, Cirincione says relative to hypopyon keratitis: "Whoever can succeed in protecting the corneal focus from contact with the conjunctival secretion, and can succeed in increasing the intra-ocular lymphatic circulation and that of the corneal lamellae, will discover the best remedy for this very grave disease." It seems very much as though his specifications are completely filled by the massive injection as detailed.

Our secretary, Dr. Francis, read a paper at the 1913 session of the American Medical Association on the "Closure of Scleral

Wounds by a Double Sliding Conjunctival Flap." This closing is also accomplished by the swelling of conjunctiva after a massive injection; the scleral lips may or may not be approximated, but the wound will be covered. It is my practice to immediately make this injection in all wounds known or suspected to have entered the vitreous or ciliary region whether accidental or operative. What an eye will stand under these circumstances without developing inflammatory reactions, sepsis or degenerative after-changes surpasses the belief of those who have not witnessed it. In a number of instances where an injection was made within the first few hours following penetration into the vitreous by shot, nails, etc., healing was as uneventful as where the cornea only had been injured by an aseptic instrument. Due to the extreme susceptibility of the vitreous to infection, the injection must be made within a few hours after penetration, or it will be too late to prevent degenerative changes, although the inflammation may still be arrested.

An extreme illustration of the foregoing claim is the case of a boy of 17, who came on the forenoon of May 26, 1914. The evening before, while at work in a coal mine, by some mischance his pick glanced and penetrated the outer third of left lower lid and the eyeball about one quarter of an inch down and out from cornea, making a jagged hole. The anterior chamber was full of blood, eyeball intensely congested and tender to touch from incipient iridocyclitis. It was explained to him that such eyes were universally removed at once, but that if he wished an effort would be made to save the ball, no hope whatever being entertained as to sight. An injection was made and in an hour or so, after covering eye with a pad, he returned to his home. He did not suffer any pain after the initial one from the treatment, and in a few days the blood was absorbed, showing iris of normal color, but pupil occluded completely. After all swelling subsided the cornea was of full size and tension normal. A dark spot about 2 mm. in size was seen under sclera just behind iris at top, where pick came near emerging, and a puckered scar at wound of entrance. After several months of comfort, he developed an iris bombe, with increased tension and some pain. The iris was punctured by a needle, and another injection made to prevent inflammation closing puncture. Since that time the iris has remained flat, is normal in size and color, tension normal and no pain or tenderness. He has light perceptions in all directions, and can tell a pocket flashlight readily at 20 feet. It is probable that a sufficient opening in iris and a cataract glass would give useful vision, in case he lost the other eye.

The question of danger of sympathetic inflammation from these retained eyes, naturally presents itself. As sympathetic inflammation seldom develops except where there has been a

penetrating accidental or operative wound, it is highly probable that it is due to germs introduced into the eye at the time, which remain dormant until certain favorable conditions for their activity arise. If this be so, and the increased physiologic processes excited by injection completes their destruction, then we need not fear this specter; but it remains for the future to see whether or not this is the fact.

After all operations for removing foreign bodies from the vitreous, whether successful or not, an injection should be made to safeguard the eye from infection, both of the original wound or any incident to operation. Several experiences of this kind have been entirely satisfactory.

A serious traumatism involving the vitreous to which I have applied this treatment in only one case, is the following:

Dec. 5, 1914, Mr. N., aged 51, came with a history of having been struck three days before in left eye by a stone, causing much pain and greatly reduced vision. The eye was congested, painful, pupil dilated and vision reduced to counting fingers. Examination showed the lens had been completely dislocated and was in the bottom of the vitreous. As extracting such lenses is usually exceedingly dangerous and uncertain, and leaving them in generally results in iridocyclitis or glaucoma, ending in blindness, sometimes calling for enucleation, he was advised to submit to an injection in hopes that it would so tone up the resisting powers of the eye as to enable it to tolerate this abnormal condition. The same was done, and he went home, reporting back on December 12. All reaction had subsided, and with a lens $V = 20/75$. On Jan. 23, 1915, $V = 20/30$ and Jaeger No. 1. No activity of any kind in evidence; lens lying in bottom of vitreous and swaying with movement of head forward and backward. It has given him no trouble except from glare up to present writing. Examined on Sept. 18, 1915, perfectly opaque lens lying deep in vitreous. Lying face down over edge of table lens drops down over pupil. With strong convex glass and pin hole, vision equals 20/30, and Jaeger No. 1. His other eye is only 20/30+. He has no redness nor pains and tension is normal.

Of penetrating wounds of the anterior chamber, some going into the lens, by nails, etc., there have been several cases in which no inflammatory symptoms whatever developed. For instance, a young man of 18 years of age came on Feb. 9, 1915. While loading hay, a broken wire of the size used for bailing hay, penetrated the outer edge of the cornea at the limbus of the left eye and traversed the entire chamber to a point at opposite limbus, pushing a little of the iris into sclera, where it almost made a counter puncture; some iris prolapsed through wound of entrance. An injection was made, and, aside from putting on a pad and black glasses, he was allowed to go where

he pleased. No inflammatory reaction occurred and his vision was perfect.

Of ruptured eyeballs there have been several cases, of which the following is a type.

Jan. 28, 1914, a boy of 17 was working in the woods with an axe when a chunk of wood struck his eye, completely rupturing the cornea and well out into the sclera on both sides; the iris protruded through full extent, with no pupil inside. He was given an injection, and returned same day to his home, making an arduous trip considering the circumstances. In one week, nothing having been done in the interval, he returned with wound entirely healed, having had no pain or tenderness. He has had no trouble since, and replies that he has a little sight in the eye.

To show that these eyes do not later degenerate, a case will be quoted from a paper entitled "A Method of Preserving Eyes Which Are Usually Removed," read before the Pennsylvania Medical Society and published in the *Pennsylvania Medical Journal*, January, 1911:

"May 26, 1907. Henry B., aged 40, had eyeball ruptured by block of wood flying from a saw in lumber mill. Horizontal wound extended across center of cornea and a little into sclerotic on each side; wound filled by prolapsed iris; eye filled with blood; no vision.

"Injection of cyanid solution was given. In a few days blood began to clear up, and it was then seen that the lens had been dislocated and was lying horizontally in pupil. However, wound healed with cornea above and below tear absolutely clear, vision returning. He was told of the complications likely to occur from the dislocated lens, and warned to return if any severe pain developed. Everything went well, with patient back at work for some time, when a violent pain seized him, and on reporting there was found a distinct attack of acute glaucoma. Adopting, as has been done in some other instances, another of Darier's claims that injection of adrenalin is capable of reducing glaucomatous tension in certain cases, a single injection of 30 minims of 1:5,000 adrenal with cyanid was made, which promptly broke up the attack. The lens is adherent by its narrow edge to corneal scar and, not filling the entire pupil, the fundus can be clearly seen. With a strong lens patient has good distant and reading vision. In this case the primary injury certainly called for enucleation according to usual standards, and the secondary complication might have required an effort to remove the lens with all its risks under the circumstances. A recent letter of inquiry elicited the reply that there has been no further trouble."

In a few cases of iritis, where the absence of vision seemed to indicate the possibility of some deep-seated complication which

could not be diagnosed by reason of inability to see the fundus, the injection has been made as a safeguard against a possible choroiditis, etc. I believe the effect is to lessen the pain, and have sometimes wondered if it might not cut shorter the course of the average iritis, but have not tested it out to a conclusion. The following is an illustration:

On May 1, 1915, a man of 30 came with a suppurative iritis so violent he had not slept for several days or nights. Although the pupil was fair sized and had no exudate, he could only tell light from dark, and the eye could not be seen into. He was given an injection containing one-quarter grain of morphia, instead of the usual eighth. Being unable to anesthetize an inflamed and painful eye by cocain drops, which were used freely, he suffered atrocious pain for an hour, as do most cases already very painful. But he suffered very little, if any, afterward. It was nearly two weeks before sight returned, during which he was using orthodox local and internal treatment. Sight was finally supernormal, as was the other eye, and nothing left to show why the case had been so unusually severe.

In the graver forms of corneal ulceration, injection is the most potent means of control we possess, either alone or in conjunction with the usual treatment employed, as iodine, carbolic acid, actual cautery, curetting, paracentesis or iridectomy. The clearness of scar tissue is a striking feature, as compared to what is otherwise usual. Instances have been observed where quite efficient vision was restored, where ordinarily leukoma would have altogether precluded this possibility. In those rapidly destructive ulcerations due to suppuration of the tear sac, it is my practice to open the tear sac, destroy it completely by electrocautery, burn the ulcer with the same, and then give an injection, all at one sitting. When done sufficiently early the result is all that could be desired; a day or two of delay will make it too late. In one case of typical rodent ulcer of the cornea, injection in conjunction with antiseptics, utterly failed. Three subsequent eyes with rodent ulcer were curetted, burned with cautery and injected all at same sitting, and healed as promptly and smoothly as the simplest forms of ulcer. They had the ulceration extending well into sclera, which is the characteristic feature for diagnosis. These cases are reported to bring out the advantage of adding injections to routine measures in cases where those measures alone, and injections alone, might both fail. In the *Annals of Ophthalmology* for July, 1915, a case is cited of a cure of an extensive retinal detachment by combined subconjunctival injection and galvano puncture of sclera.

In conclusion let me ask those who look on the measures advocated jeeringly or with neutral indifference to try it on some of their cases of penetrated, ruptured, or extremely ulcerated eyes, or iridocyclitis of not too long standing, which they would ordinarily enucleate, and if it proves good, use it on eyes which are supposed to have a fighting chance. It is said that the elder Critchett was wont to facetiously remark he could not sleep well at night if he had not removed an eye that day. Had he known of and practiced massive subconjunctival injection up to its capabilities, he would, no doubt, have spent many a restless night.

DISCUSSION

DR. E. B. CAYCE, Nashville, Tenn.: Dr. Jones has added a chapter to ophthalmic therapy in this work. He has taken a treatment that has been discarded and declared useless, and he has revised it and standardized it and made it a useful remedy. I have been using the injections according to this outline for three years. I have not used it as vigorously as he, and my patients have complained longer of pain than three hours. However, the results have been very encouraging in my hands. I have seen iris attachments become detached in a few days after injection. For this I have added 1/150 atropin. In perforating wounds, especially in children, I have not used it in all cases where I had every reason to believe there was an infection. I have waited until the infection was evident, three or four days, and then used the injection. Something like five months ago a boy 6 years old with a perforating wound in the lower part of the eye, in the ciliary region was brought to me. I gave an anesthetic and used 1 in 2,000 rather than 1 in 1,500. The case was ordered back in two weeks. I did not see the case until a few days ago and the eye was soft and had every indication for enucleation. This cannot be held against the subconjunctival injection. Following cataract operations I have used it in two cases. In one case I used it in the fifth after the infection was evident. The other case was a staphylococcal infection. The smear showed three colonies before operation and I thought it a safe risk. I used the injection and the eye has 15/20 vision. Citrate of soda was used extensively in our city, but I think most of the oculists of Nashville have given up the use of it. In beginning opacity of the lens, Major Smith has suggested a mild use of the citrate of mercury. I have used it in seven cases. In one it seemed to hasten the formation of the cataract. In two cases we had very gratifying results with normal vision. All of these cases I gave dionin in 2 per cent. solution. How much was due to instillation and how much to injection I cannot say.

DR. E. J. BERNSTEIN, Kalamazoo, Mich.:—I have had no experience with strong solutions in subconjunctival injections, but fully twenty years ago I wrote a paper on the use of subconjunctival injections of mild solutions—1 to 5,000. This was read at the meeting of the Ophthalmic Section of the American Medical Association at Atlanta and I have been using this method of treatment ever since, but with decreasing frequency. I was then very enthusiastic about it and collected, from various sources, especially in France, evidence of its efficacy in almost every known ailment with which the eye is afflicted. My experience is that most of those earlier statements do not hold water, but it must not be understood that I either condemn or fail to appreciate the fact that subconjunctival injection

tions have a decided place in our armamentarium. As a matter of fact, it is a very decided adjuvant in the treatment of deep and superficial infections. At the time I wrote this paper it was thought that injections were germicidal in their actions, but some experiments which I conducted and the results of other men showed plainly that its action was due to a stimulation of the lymphatic system of the eye. Another thing I wish to emphasize in this connection and that is the question of pain in the use of the injections. It is a bugaboo which has frightened many men from its use. I do not find that my cases have pain to anything like the extent that other men find, I always add a small quantity of morphia to my solutions and that seems to make it so painless that even very sensitive patients do not complain.

DR. WENDELL REBER, Philadelphia:—We do get a good deal of pain from subconjunctival injections of mercury. I have used them for twenty years. In hypopyon corneal ulcer this is the sheet anchor of treatment. I use 1 per cent. acoin subconjunctivally preceded by cocain, and then in ten minutes the mercury which is much more painful. I believe it is a decided addition to our treatment. I have tried it in incipient cataract and am doubtful as to efficacy. But there is no doubt about its value in infected purulent injuries about the eye, and in hypopyon ulcer, traumatic or nontraumatic.

DR. JOHN GREEN, JR., St. Louis:—I recently had a case of chronic uveitis with membranous opacities in the vitreous nonsyphilitic and non-tubercular, in which classical methods—mercury and the iodids—had failed to make any impression. Twenty minims of 1-4,000 mercury cyanid were injected subconjunctivally. There was some pain, controlled in an hour by iced applications, and much chemosis and edema of the lids. The patient departed for home the next day. On her return a few months later, hardly a trace of vitreous opacity was to be seen. A tuberculous choroiditis with subsequent involvement of the ciliary body and iris recovered, under tuberculin therapy, but the vitreous remained full of opacities. A single cyanid injection was followed by partial clearing of the vitreous with an increase in vision.

A young boy of 14 sustained a penetrating wound of the cornea and sclera. There was a prolapse of the iris and ciliary body with a wound of the lens. I did an iridectomy and washed out what I could of the lens masses. After a few days, pain and clouding of the aqueous denoted beginning infection. The following day chemosis appeared and I feared panophthalmitis. I injected 30 minims of 1-2,000 cyanid. The boy writhed with pain for hours and I had to resort to morphia. The following day the conjunctiva was tremendously swollen and the skin of the lids and face edematous. Within forty-eight hours it was observed that the aqueous was clearer. In short, all signs of infection disappeared and the boy made a splendid recovery. Vision 6/20, which will doubtless be improved after division of the membrane.

DR. M. M. CULLOM, Nashville, Tenn.:—Like Dr. Reber, I do not want to prolong the discussion but I would like to relate one experience I had with the subconjunctival injection of cyanid of mercury. I had a patient who sustained an injury of the eye which I saw a few moments after it occurred. He had a linear cut extending from the corneoscleral margin above down across the cornea extending down to Descemet's membrane. There was no indication of a penetrating injury. He did well for a few days, when a violent iritis set up, which went from bad to worse. For three weeks it looked as though he would lose the eye. Then areas of exudation appeared on the anterior capsule of the lens and I was in a panic for fear of sympathetic ophthalmia. Just when the

case looked most hopeless I gave a massive injection of the mercury solution combined with dionin and morphia. There was a violent reaction but very little pain, due of course to the combination of morphia and dionin. The eye began to clear up from the time I gave the injection and returned apparently to normal. Eighteen months later he developed another attack of iritis. I treated the iritis in the ordinary way and it did not develop the severity of the first attack. One day while examining the eye I noticed something white at the corneoscleral margin. At first glance I took it to be the scar from the injury but on cutting down on it with a Graefe knife I detected a foreign body and extracted a sliver of wood that had penetrated the eye at the corneoscleral margin and had hidden itself underneath the sclera. After that the recovery was prompt. I have often thought since of that injection of mercury. By rights that patient should have had a sympathetic ophthalmia. He had a foreign body inside the eye setting up an infection and I feel sure in my own mind that the injection prevented it. He has as good vision in the injured eye as in the other, both having keen acuity. I saw another case of injury similar to this case of Dr. Jones. A man was baling hay, the wire broke and gave him a penetrating injury of the cornea. When I saw him the anterior chamber was full of greenish pus and the eye presented a perfect picture of beginning internal infection of a virulent type. I advised a massive injection of the mercuric solution. The physician who was an oculist from a neighboring town took him home and gave the injection and reported that the eye cleared up and was saved.

DR. CHARLES D. THOMAS, Peoria, Ill.:—This paper and discussion brings out the ever-present condition that we always face, and that is, a remedy or technic highly extolled to take the place of one that seems quite efficient. We accept this new technic, use it for a length of time, yet we are always questioning whether we should continue this or not, and we are apt to question whether we do any better with the remedy so highly extolled than we would with our old technic or remedy. That is the condition we find ourselves in with regard to cyanid of mercury injection. To illustrate let me relate two or three cases.

The first was a child cutting a little rope above her head with a pair of scissors. She was looking up when the scissors came down, points first, and went into the eye, making a deep wound through the cornea, iris and bulb into the posterior chamber. There was serious reaction and I was exceedingly anxious as to the result. I used the injection with the result that the immediate condition and symptoms from the injection were alarming. I was somewhat prepared for pain and distress, but it was far beyond anything I expected. I was alarmed. While the ultimate result was fairly good, in that I did not have to enucleate the eye, but the immediate results were so severe that I never tried it again. Following this case was one with a severe wound through the cornea, iris and bulb from a piece of steel; I had to make a sclerotomy and extract the steel with the Robb magnet. This case without the cyanid injection got along all right. Another case of a boy with a bad wound in the cornea, iris and lens from a flying piece of steel which required a sclerotomy and extraction with the magnet. I thought of using the injection but did not, and the case came out well. Another case of a man where a nail struck him squarely in the cornea and went so far into the bulb that it produced a terrible wound and required some tension to extract it from the wound. I refrained from using the cyanid of mercury. The result was not as bad as I expected, the bulb was not lost, no phthisis bulbi and no enucleation. I cannot say it would have been better had I used the cyanid. I employed customary remedies, especially the yellow oxid of mercury for whatever

good it might do, but the results were apparently just as good as would have been obtained had I used the cyanid. So I conjure, Would my results have been any better had I employed the cyanid of mercury? I am willing and anxious to be convinced.

DR. E. L. JONES (closing discussion) :—In regard to using this injection in all injuries. I do not pretend to use it unless I think it is going to be almost surely destructive. It increases greatly our chance of saving the eyes. I do not think it is chemically germicidal. It is the physiological reaction. It increases the ways in which Nature works. What we want to do is to try to help Nature to do the things Nature cannot do without help. As to the pain, so many say they can not do it without so much pain. I cocaineize these eyes much longer than the ordinary operation and then use the morphin, one-eighth to one-sixth grain when there is no pain, or one-quarter grain if there is. Colonel Smith says one-half grain in advance, by hypodermic. I know that some of the cases would have been lost without it.

FURTHER EXPERIENCE WITH RHINODACRYOCYSTOSTOMY, WITH SUGGESTIONS FOR BETTERMENT IN TECHNIC

J. SHELDON CLARK, M.D.

FREEPORT, ILL.

At the last meeting of the Academy, held in Boston, it was my pleasure to give this society in some detail the intranasal operation as performed by Dr. J. M. West of Berlin, Germany, for relief of disease of the tear sac.

Correspondence that I have had with members of this society and others has caused me to address you again on the same subject and give you the experience gained since then. Furthermore, certain modifications have been adopted that I deem would be of interest to you.

We know that in the past all manner of methods have been devised for treatment of cases of dacryocystitis. Pages have been written regarding this or that style of probe to be used in dilating the nasal duct. Then the intranasal work that centered its attention upon the nasal duct; the work of Toti, who does his operation by an external incision, and numerous other methods. All of these procedures have their adherents.

With the use of the probe, one has in mind the nasal duct as being the chief seat of disease. We should not center our attention on the duct. Any condition that is not benefited by a few judicious probings had better not be subjected further to this treatment.

There is an anatomic reason for the frequency with which we meet stenoses of the duct. The duct is a short passage, and varies from 7 to 10 mm. in its bony structure. At the proximal end it flares out into the lachrymal sac, and distally it becomes a rather indefinite space beneath the inferior turbinate body. The duct is lined with cylindrical epithelium of two layers. A very little inflammation in the bony portion of the duct readily gives rise to interference with the nutrition of these cells and agglutination takes place.

We therefore should see that the therapeutic measures we use upon the duct are in most cases futile by reason of the anatomic structure, whose architectural formation thwarts us

constantly. We probe through the constriction one day and a day or so later find about the same obstruction confronting us. To my mind, if we do not get results from two or three probings, then we might as well desist from further efforts along this line.

The general surgeon has shown us how to get rid of infection and diseased structures by making short-circuits. Once this is secured the pathology usually disappears. The aim, then, of this operation, is to get a direct communication between the lachrymal sac and the nasal chamber.

Intranasal work upon the nasal duct is necessarily mutilating and destroys structures that should be conserved. Such work calls for resection of the inferior turbinate, in its anterior portion, and then the laborious channeling of the duct, with considerable resultant hemorrhage.

The Meller operation is to be spoken of, for where there are contraindications for the intranasal work, then this procedure is most admirable. The technic of the Meller total excision is not the most simple. It is quite imperative to get out the sac in toto. Remnants left speak for failure. There is undoubted epiphora following and there is the dread, on the part of the patient, of a resultant scar and at times this does occur. One could not operate in presence of phlegmon, while by the intranasal route this can be done.

We must not lose sight of the aim of the operation, and that is to short-circuit the duct, and leave it out of the category altogether; thus getting permanent surgical drainage of the sac directly into the nose. You will note that we have said permanent drainage. An operation that secures drainage for but a few weeks is quite apt to result in ultimate failure. Operations that mutilate the canaliculi unduly are not desirable for the very reason that interference is had with the suction action of the tear apparatus, and this will result in epiphora.

Most of the chronic cases of dacryocystitis one sees nowadays have had a previous slitting of the punctum and canaliculus. Many of these incisions have been made too large. This materially affects the pump-like action of this structure. If the upper punctum and canaliculus are intact it will help. Then, too, there are strictures and false passages that one encounters.

What are the indications for this operation? Epiphora that is caused by stenosis in the nasal duct, and that cannot be cured by a few judicious probings. Epiphora that is caused by trouble at the punctum or along the lumen of the canaliculi, or by lack

of proper muscular tone in the orbicularis muscle, which in turn prevents the eyelids from making proper apposition to the eyeball, and thus mechanically permits the tears to well over the lids, would not be bettered by work upon the floor of the sac. It is indicated in dacryocystitis, stenosis in the duct, cases of phlegmon or fistula.

The technic of the operation varies with the situation found anatomically within the nasal chamber. If the septum is pushed well over to the outer wall, and presses against the middle turbinate body, then one must do a preliminary high submucous operation. This is further indicated, for its near approximation to the floor of the sac would necessarily interfere with drainage.

Should the middle turbinal overlap the floor of the fossa, then a resection of the tip should be done.



Fig. 1.



Fig. 2.

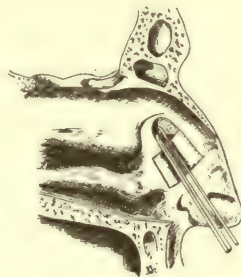


Fig. 3.

How are we to determine, from intranasal inspection, the position of the lachrymal fossa? By inspecting the nasal chamber high up and just in front of the normally placed middle turbinal, one detects a protuberance that is an anatomic entity; called by Dr. West the *Torus lachrymalis*. This elevation is caused by the convex surface of the lachrymal fossa protruding, as it were, into the nasal chamber.

The formation of the lachrymal fossa varies in different skulls. If the nasal process of the superior maxilla furnishes most of the bony floor, then one will necessarily encounter fairly heavy bone. Again, if it is mostly the thin paper plate of the lachrymal bone, it is much easier to chisel off the floor. Therefore the ease with which one perforates the floor depends on the character of the formation of the fossa. It is always well to get the bone off high up. This insures good drainage.

As to anesthesia. The operation can be done under local cocain-adrenalin anesthesia, supplemented by the use of one half

of 1 per cent. solution of novocain injected in the parts. My experience has taught me that a general anesthesia gives one better control of the situation, and so I have come to use general anesthesia at the point in the operation where I begin my work on the bone. The denudation and preparation may be done under local anesthesia.

The position of the patient should be that of the half-sitting posture, with the head thrown well back; for we are working high up in the nose.

Care should be exercised in making the mucoperiosteal incisions. One should not indiscriminately scratch about, but have



Fig. 4.—Shows the point at which the small stab wound is made, where one does not wish to use the canaliculus in the work with the probe.

definite lines to work to. The lines for the incisions are shown in Figure 1. It is well to have the incisions overlap as shown, for if this is done the subsequent removal of the mucoperiosteum is much facilitated and no ragged edges are left. One may or may not extend the incision so as to have a flap of mucoperiosteum attached at its base and later replaced. The idea of this is to give a better view of the field of operation.

Having denuded the *Torus lachrymalis* of its mucoperiosteum, one is ready for the chisel. It has been my practice for some time to make a slight nick in the bone above and below with the straight chisel. The curved chisel is then placed on the *Torus lachrymalis* anteriorly, and the point of the chisel is directed

toward the equator of the eye. If a self-retaining nasal speculum is used, one can both hold the chisel and use the mallet. If not, then an assistant may stand behind. I prefer having my own sense of resistance offered the chisel.

Having removed the necessary amount of bone, and one should see to it that the bone is removed well up on the floor of the sac, then one should orientate himself by means of a sound passed through the lower canaliculus and pressing the sac into the fenestrum made in the floor of the lachrymal fossa. Observation should be made within the nasal chamber as to how freely the sac's inner wall can be pressed into the opening (Fig. 2).

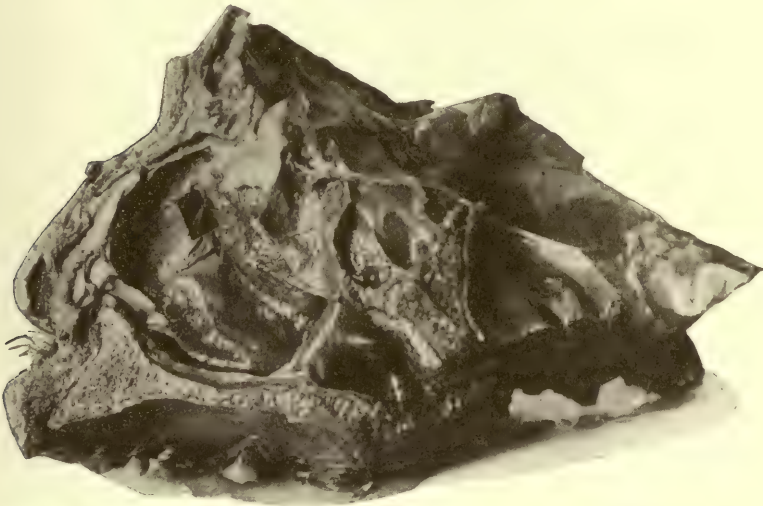


Fig. 5.—Shows the relative position for the incisions and the window made in the lachrymal fossa and outer wall of the nose. Probe shows at center of opening; sac having been opened.

To pass a fine Bowman probe into a simple dilated puncta is not always an easy thing to do. Then, too, a very fine probe is likely to puncture through the sac wall and be a source of annoyance. In the after-treatment repeated washings of the sac must be done. This is important in effecting a ready healing. A very slight incision of the punctum, I have found, does not interfere with its physiologic action.

Pressing the sac into the nasal chamber, one makes an incision in the sac anteriorly. Then with the sac punch forceps the inner wall of the sac is removed. I prefer this method to that of using the grasping forceps and the knife. The illustration (Fig. 3) shows the use of the grasping forceps and the knife.

My experience is that at this juncture the sac eludes the grasp of the forceps somewhat like the dura does the burr in the mastoid operation. I would therefore heartily recommend the punch forceps for this work.

Since observing the work of West in Berlin, I have had a number of patients that I have operated on with signally good results. In only one do I have any doubts concerning the efficacy of the operation. This was in a woman who had a very bad ozena.



Fig. 6.—The position of the patient. Half reclining posture with the head thrown well back. The chisel has been placed on the torus lachrymalis and the assistant is using the mallet.

A Mrs. C., whom I saw last June, came to me after having been probed on many occasions. She had had a very severe corneal infection with not much more than Descemet's membrane left. Her vision in that eye was only light perception. She wished relief for her dacryocystitis and a complicating sympathetic epiphora in her well eye that made reading impossible. Her lower canaliculus had been widely slit and adhesions had formed in its lumen. It was impossible for me to enter the sac by way of the canaliculus. I therefore took the small right-angled knife and made a direct cut into the sac through the skin. This was merely a stab wound of some 3 mm. (Fig. 4). This gave me ready access for the probe and the inner sac wall was easily pushed through the opening made in the fossa and the sac punched out as described before. This stab incision readily admits the cannula of the syring so one may wash through at

each subsequent day's dressing. The washing through of blood clot and secretions is of much importance in securing a good result. One can keep such an opening patent for ten days and it will heal without scar formation.



My records show a total of ten cases to date operated by me intranasally, and I may say that the results obtained have given better satisfaction than a corresponding number wherein the total excision was done.

AFTER-TREATMENT

There is some reaction in the way of swelling and some discoloration about the eye, but this, however, is very slight. A very small wick, of preferably xeroform gauze, should be carried

to the opening made in the floor of the lachrymal fossa. We do not pack the nose. The lachrymal syringe is now used to gently force boric acid solution through the sac and into the nose. This is done either by way of the canaliculus or the small opening made over the sac. This should be kept up until the solution runs from the nostril. During this procedure the head is tilted forward. On the third day the strip of gauze is removed and irrigation is again instituted. At this and each subsequent dressing the sac is washed through until all clots are washed out and the solution returns clear, or reasonably so. This irrigation is kept up for a period of ten days, when the patient is free of trouble.

CONCLUSIONS

Following such a technic as outlined one can be assured as to these points:

1. The patient, after operation, has a functioning tear apparatus. This is of paramount importance.
2. There is no resultant scar.
3. One may operate intranasally in the presence of phlegmon or fistula.
4. Epiphora is eliminated.
5. It is not necessary to contemplate a possible secondary operation upon the lachrymal glands.
6. Choose your cases. One canaliculus should be in working order and preferably the lower; however, a very good result will be obtained where only the upper functionates. Senile changes in the lids is a contraindication. Do not operate on the extremely old or too young. Do not operate in the presence of ozena or ethmoid or other sinus disease.

INSTRUMENTARIA

For the proper performance of the work it is well to have some special instruments. Messrs. V. Mueller & Co. have made the following: A long-handled knife with a thin blade. A small mucoperiosteal elevator. Two chisels, one straight and the other with a special curve. One universal handle for the small knives that are used for the incisions within the nose. One of the knives is a right-angled one and the other has a beak point. The right-angled knife is used for the rather vertical incisions and the other for the longitudinal ones. A special sac punch, and if one wishes the special grasping forceps, that may be used in the universal handle for such instruments.

DISCUSSION.

DR. W. B. LANCASTER, Boston:—I have known of the following complication to occur. The lacrimal secretion on reaching the inferior meatus normally runs back into the pharynx. In this case, being discharged into the middle meatus, it ran down forward and appeared as a perpetual drop on the end of the nose. Is this rare or common?

DR. G. M. CASE, Elmira, N. Y.:—I have been doing for many years a similar operation to the one described by Dr. Clark, but I make an opening from the inferior portion of the lacrimal sac, downward and inward through the bone coming out just under the middle turbinated bone. In many of these old cases of dacryocystitis the canaliculi have already been slit to get proper drainage of the sac; if not, this will be required before attempting this operation, and it is quite necessary that the opening into sac should be stretched freely by means of pair small artery forceps. The bone at this point is very thin, so it is a simple matter to get through it. I use a small burr I got in London, and by little force it readily slips through bone into nose. I go in at an angle of about 45 degrees, but this can be varied according to anatomy of the nose. By using cocain in nose and lachrymal sac the operation is almost painless and can be done in few minutes. The opening can be probed occasionally to keep open, or patient can wear a small gold tube, open on top, and fitted into the slitted canaliculus so as to be invisible. It is nonirritating and can be worn for years. I had one patient wear one for fifteen years. Of course, if you want to preserve the canaliculus this operation is not indicated.

DR. J. E. BROWN, Columbus, Ohio:—I would like to put some questions to the essayist, who probably has at hand the statistics, that would cause him to make a choice of this procedure in a case looking forward to cataract extraction. We have a considerable number of cataract cases in which there is lacrimal obstruction or an infected lacrimal sac. I have not thought of any other method of procedure in these cases than extirpation of the sac, for which I have adopted the technic advised by Meller, and which has proved perfectly satisfactory. Would the essayist feel satisfied with the operation he has advocated in his paper for these cases—feel that in it he had rendered his field of cataract operation protected against infection from the lacrimonasal drainage area? What can he say as to the relative merits of extirpation and his method in these cases?

Another point: I understood him to say that he liked better and usually did the operation under general anesthesia. My own inspiration in almost all intranasal surgery is to use local anesthesia where it is at all feasible. Does he have under general anesthesia an increase of hemorrhage sufficient to be a serious annoyance in any frequency? What is the position of the patient during operation?

DR. J. A. HUISINGA, Grand Rapids, Mich.:—Some of us have had very good success with the more conservative methods, and it is a question whether the older and simpler methods should be put aside in favor of the one proposed by Dr. Clark. Eighteen years ago I tried to establish a direct communication for drainage between the sac and the nasal chambers. The temporary relief obtained was invariably followed by ultimate failure. I fail to see wherein Dr. Clark's method is superior to the one attempted by myself and others long ago without ultimate success, and therefore I am not entirely convinced that the older methods of extreme dilation or destruction of the sac should be superseded by the method advocated by Dr. Clark.

DR. J. C. BECK, Chicago:—I have had some experience with this operation. While at the last meeting I expressed myself as being very much opposed to this technic, I had hopes that another year's work would so

perfect the operation as to justify the rhinologist in taking this field from the ophthalmologist. I have operated seven cases this past year—some by the method suggested by Dr. Pratt of Aurora in using the burr. All have changed from a purulent to a semipurulent or mucous discharge, but the physiological action has not returned. One is not as enthusiastic in slitting the canaliculus as formerly, as this interferes with the suction function of the tear duct. I believe the eye men will do better by removal of the tear sac unless Dr. Clark can show cases that are normal after many years.

DR. CLARK, (closing discussion):—The trend of this discussion seems to be "show me." If by bringing this subject before you I have caused you to be less a lover of the lacrimal sound and the older methods of continuous and repeated probings of the nasal duct, then will I think that we have not "labored in vain." Its very anatomical structure thwarts us in our endeavors to keep the nasal duct open by probing. The duct passes down through bone. The lining of the duct is composed of two layers of cylindrical epithelium on a basement membrane. In dilating the duct, injury is done these cells with consequent edema and resultant agglutination. As I said in the paper, if after two or three trials one cannot obtain a patent lumen, then all probing should be stopped.

Dr. Lancaster speaks of some cases that have been observed in Boston, where there was a drop of secretion almost continuously at the end of the nose. This, I will say, has not been my experience, nor did I observe this resultant condition in the thirty-five or forty cases that I saw with Dr. West in Berlin.

Dr. Case speaks of several cases he had not operated intranasally, but where he went directly into the nose (one case a baby). In these cases of blennorrhoea in the newborn we know that the most of them will clear up with simple syringing, probing for one or two sittings, and in some cases they will right themselves without treatment. I do not think babies need operative interference often.

Dr. Brown asks if the operation is used preliminary to cataract extraction, where there is a condition of dacryocystitis. Personally I do not believe I would do it, though Professor Silex of Berlin turned over such cases to Dr. West for preliminary treatment and these were operated intranasally for drainage of the tear sac.

With regard to anesthesia. I have operated on cases by the aid of cocain-adrenalin and one-half of 1 per cent. novocain solution but where the bony structure is heavy, I do the preliminary work under local anesthesia, and then finish the bone work under ether. Most of the patients undergo the work well up to the point of using the chisel, and here they complain some. As for bacteriological examinations, these have not been made by myself.

Dr. Beck speaks of the importance of a functioning tear apparatus when you are through, and reported his experience with the operation as proposed by Dr. Pratt, and others, of dilating the canaliculus up to a No. 12 Theobald sound and then going through with a burr. This sort of work, in my mind, destroys the action of the punctum and canaliculus, also possibly injuring the sac wall, and while you may get rid of the infection in the sac you do not have a functioning tear apparatus left. This Dr. Beck and others have found to be true in such methods of operating. I said that any operation that interferes with the function of the punctum, the canaliculus or that injures the wall of the sac will not give good and lasting results from a physiological standpoint.

To avoid all injury to the punctum or canaliculus, I have offered in this paper the idea of making a stab wound about 3 mm. in length directly over the sac and thus gain an entrance to the sac and have an opening

through which to wash through with the lacrimal syringe in the after-treatment, which, by the way, should be persisted in for ten days. One can, however, do all this through the dilated punctum of the lower lid, but it is sometimes rather tedious.

My cases all show signally good results. I have operated on the very young, at 6 or 7 years of age, and upon those of 70. Many of these had been wearing styles for years, others with the fistulas, etc. In ten days to two weeks fine results were obtained.

One case I got through Dr. Beck has a good result so far as her dacryocystitis is concerned, but she has an epiphora due to the fact that her lower canaliculus was entirely closed off, and perhaps some damage had previously been done the sac wall to the ocular side.

One case of marked rheumatism in a woman some 65 years of age was cleared up as if by magic upon getting the tear sac drained. So in looking over focal points of infection, do not overlook the tear apparatus.

This operation has for its aim not alone the riddance of the dacryocystitis, but it gives one a functioning tear apparatus when all is over. The objection to previous operations for excision and modifications of this operation where the canaliculi are disturbed is that one does not have function left. The operation is admittedly technical, but its value has been proved and the intranasal drainage of the tear sac should not be condemned because of other work that has not followed out the technic here given and has proved unsatisfactory to many. You can get rid of the infection by getting rid of the sac or obliterating it, but you do not have function. Function is the sine qua non and should be thought of in treating cases of dacryocystitis.

PALPEBRAL SYPHILIS, A REVIEW WITH CASE REPORT

FRANCIS W. ALTER, M.D.

TOLEDO, OHIO

The participation of the eyelids in a syphilitic process, relatively speaking, is rather a rare event. In an article entitled "Syphilis in the Innocent," by L. Duncan Bulkley,¹ of New York, he states that 25 per cent. of all cases of lues are extragenital, and of this 4 per cent. were on the eyelids. They were placed by him as ranking fifth in order of location for extragenital primary infection.

A very comprehensive review on the frequency of palpebral primary involvement is given by C. E. Finlay² in an article entitled "Double Chancre of the Eyelid." He says in part: "In literature at my disposal I have found reports of about 100 cases, and from different writers the total summing up of cases seems to be in the neighborhood of 500." He also gives the following quotations relative to the statistics on the subject:

"Willbrand and Staelin, in 16,615 cases of syphilis, in 307 of which the primary sore was extragenital, do not mention a single case of chancre of the eyelid. Peppmuller finds the proportion of chancre of the eyelid as 4 to 5 per cent. of other extragenital chancres. Lesser in 201 cases of chancre found 16 extragenital, one of these being situated in the eyelid. Talbot found 3 cases of chancre of the eyelid in 434 cases of syphilis. Neumann found in literature 162 cases of lid chancre among 613 extragenital ones, having personally observed 2 in 86. Prosek found 2 cases of ocular chancre, one on the lower eyelid, in 469 cases of extragenital chancre. Nivet, quoted by Mohr in 595 cases of extragenital chancres, found 413 in the head and 15 in the lids. Fortuniades compiled 118 cases from literature. Ziessel found 8 cases of lid trouble in 40,000 cases of syphilis. Alexander found 247 cases of chancre of the lid in 931 extragenital cases. Müncheimer places it in the seventh place among extragenital chancres, after the lips, breast, mouth, finger, hands and tonsils. As a rule, it is, however, granted the third place after the lips and finger

1. Bulkley, L. Duncan: Alvarenga Prize, Coll. of Phys., 1891.

2. Finlay, C. E.: Arch. Ophth., July, 1915.

(Knies, Michel, Gruder). Porey Koschitz, in 852 cases of extragenital chancres, found 132 in the eyes, most frequently after the lips. Tepljachin and Pospelow found from 15 to 25 per cent of the population of two Russian villages thus affected."

From the foregoing it is apparent that syphilis of the eyelids, although relatively unusual, is encountered frequently enough to enlist our very earnest attention.

Palpebral syphilis may be said to be one of the many and varied expressions of this omnipresent affection with its manifold and protean characteristics, and it is because of its importance and at times veiled character making the diagnosis difficult, that we offer this résumé and case report before this Academy. Its clinical behavior in its differential aspects is oft-times puzzling and without a doubt in many instances the failure to make a correct interpretation is not unusual.

One should look with suspicion on a lesion of the eyelid having somewhat the appearance of a hordeolum with some of the corallary characteristics of a chalazion. We may find added to this more or less inflammatory edema with a nibbled punched-out area at the lid margin, and an absence of cilia in the affected region. Another factor which is especially constant is that the lesion will be characterized by a marked degree of indolence and chronicity. There will also be an enlargement of the preauricular or submaxillary glands. The diagnosis in such a case should be established or disproved by a search for the *spirocheta pallida*, supplemented by a Wassermann reaction. If it is a primary lesion our clinical diagnosis is much strengthened by being able to demonstrate the existence of an indurated base to the ulcer.

It has been said, and, with no little force, that our success as oculists at times is in direct ratio to our qualifications as syphilographers, and in this I think you will bear me out.

With the discovery of the *Spirocheta pallida*, the Wassermann reaction, and the introduction of salvarsan, which followed in its wake, we have been given the means of clearing up doubtful cases and thus a strengthening and fortifying effect has been added to our diagnostic and therapeutic resourcefulness which can scarcely be over estimated.

Palpebral syphilis, as already mentioned, in any one of the three stages is not common. In the first stage the chances of the lid becoming affected are very small.

The most common source of a primary lesion is through kissing or the practice of attempting to remove a foreign body

from the cornea or lids by means of the tongue. However, the modes of infection are as various as the possibilities for placing the spirochete in contact with the eyes.³

Several cases have been in physicians and midwives who have conveyed the poison by means of fingers to their eyelids. Two instances are recorded where physicians received the infection from patients coughing into their face.³

Bulkley cites the case of a female practitioner in a Russian town in 1886 who caused an epidemic of lid and conjunctival chancres in her efforts to remove foreign bodies from the eyes and to cure trachoma. She was the cause of sixty-eight cases of syphilis at the time of this epidemic and thirty-four cases of direct infection resulted from this woman's efforts.³

The primary lesion seldom develops on the outer skin, but is almost invariably intermarginal or in the canthi or upon the tarsal conjunctiva. This is due to the fact that the cutis of the lid is not especially permeable, but the delicate textures of the canthi where the dermis changes to mucosa, and where the glands of the conjunctiva and the meibomian glands exude their contents, offer easy inoculation of the virus.

The preauricular and other glands are often so swollen that a diagnosis of mumps might be easily made.

The chancre develops as elsewhere and needs no special description other than to say that it takes on the same traditional characteristics as elsewhere, to-wit, ulceration, induration and adenopathy. Its principal means of differentiation from similar morbid conditions, such as vaccine pustule, lupus, tuberculosis, hordeolum, chalazion, and gumma, is in the indolent nature and frequently marked swelling of the neighboring lymphatic glands.

In looking up the literature of the subject, I have been impressed with the fact that the diagnosis of syphilitic chancre of the palpebrum is not always so simple.

Mahon pon y Marques⁴ reports a case where there was considerable difficulty in the diagnosis of chancre from tuberculosis, especially on account of the lymphatic involvement. In his case he inoculated a rabbit's eye with some of the exudate, but it proved negative for tuberculosis. Antisyphilitic methods were followed by a rapid retrogression of the ocular symptoms and manifestations. In connection with this method of diagnosis we might add parenthetically that a search for the spirochete and a

3. Bulkley: Quoted by Shoemaker, *Ann. Ophth.*, July, 1911.

4. Marques, Mahon: *Arch. d. Oftal.*, January, 1913.

Wassermann reaction might have been an additional aid in arriving at a diagnosis.

Cauvin⁵ relates a case of hard chancre of the lid in a child of 10 months. No source of infection could be found. The parents were free from luetic taint, as was also the nurse. Under treatment it rapidly disappeared leaving only a small area devoid of cilia to mark its previous location.

Pannunzio⁶ reports a case of primary infection of the fornix of the upper lid in a girl of 15. The diagnosis was verified by smears and on prompt antisypilitic measures the ulcer cleared up.

In the minutes of the College of Surgeons of Philadelphia, I find that Dr. William T. Shoemaker⁷ showed a case of chancre of the eyelid and called attention to the difficulty of diagnosis. The patient was a woman, 30 years old, and the source of infection was probably her husband. The lesion first showed itself at the inner angle of the right eye on the upper lid. It looked exactly like a hordeolum. It later spread to the lower lid and involved the entire inner angle. The submaxillary and preauricular glands were considerably swollen. One interesting feature in this case is that the patient avers she noticed the swelling of the preauricular gland before she noticed the trouble in her eye.

de Schweinitz,⁸ at the same meeting, also reported a case of chancre of the lid which he followed for a period of some twelve years. The original lesion disappeared after six months' treatment, but the entire upper half of the cornea showed a typical pannus almost like pannus trachomatosa. The corneal epithelium was hazy and blood vessels were present in great numbers. The vessels, strange to say, did not appear below the pupillary area. Pannus increased for one month and then gradually subsided. The cornea never cleared up entirely, but the vision increased from 6/60 to 6/12 with glasses. At the end of twelve years the cornea shows only a few chalky deposits and a few irregular opacities.

Dr. de Schweinitz referred to the well-known fact that in a certain number of instances a keratitis in acquired syphilis, in all particulars resembling a true parenchymatous or interstitial keratitis, has followed lid or conjunctival chancres. This occa-

5. Cauvin: Arch. d. Ophthal., October, 1909.

6. Pannunzio, M.: Arch. d. Oftal., January, 1914.

7. Shoemaker, Wm. T.: Min. Coll. Surg., Philadelphia, November, 1910.

8. De Schweinitz, G.: Min. Coll. Surg., Philadelphia, November, 1910.

sionally, as mentioned above, may be a true pannus resembling in all respects a pannus such as is met with in "granular lids," depending as it does on the formation of blood vessels between Bowman's membrane and the corneal epithelium, and to which the pannus found following chancre of the lid conforms in all respects.

While the lesion on the lid may clear up satisfactorily, an involvement of the cornea following in the course of a primary lesion of the palpebrum would make the prognosis for the affected eye quite grave. This is shown in the case reported by de Schweinitz above, and also in the following case reported by C. A. Clapp:⁹

"Patient presented a painful indurated mass near the inner angle of the upper lid over which the skin was freely movable. The conjunctiva was thickened over the tumor. Incision and curettage brought away only broken-down cellular tissue. Later there appeared an ulcer at the limbus underlying the tumor of the lid. This gradually involved the cornea. As Wasserman reaction was positive and the patient responded to antisyphilitic treatment, he believed it to be a gumma."

Admittedly chancre of the eyelid is unusual, but C. E. Finlay¹⁰ reports a case of double chancre of the eyelid which indeed is exceedingly rare. The patient worked in a tobacco factory with several hundred other workers. In common with the 200 other employees she used the common wash bowl and roller towel. This was the possible source of infection. The patient had some irritation in the eye and used this bowl and water for the purpose of bathing the eye. Some time afterward she developed two chancres on the eyelid, one near the outer canthus and the other near the caruncle. This diagnosis was confirmed by a positive Wassermann and the demonstration of the *Spirocheta pallida*.

Finlay goes on to say: "Among the clinical features of the case one of the most interesting is the double lesion, at the inner canthus and outer commissure. In literature I have found eight other cases of double chancre and one of triple chancre.

"The lymphatics of the eyelid drain to two principal nodes. Those of the outer two thirds of the lids drain to the preauricular node and those of the inner third drain to the submaxillary nodes.

9. Clapp, C. A.: Ophth. Rev., June, 1911.

10. Finlay, C. E.: Arch. Ophth., July, 1915.

"Poitoux has called attention to the fact that chancre of the outer third is characterized by an enlargement of the preauricular gland, while chancres of the inner third cause submaxillary enlargement."

Antonelli¹¹ reports the case of a working man who washed his eye which had been injured, with water from the glass of a fellow workman. As the irritation increased, he consulted Antonelli six weeks later, who found edema of the lid with small excoriations, true tarsitis, marked chemosis with injection, swelling of the plica semilunaris but no ulcer. An induration of the external commissure could be felt, with painless swelling of the preauricular and a greatly enlarged submaxillary gland. Morax, who examined the case in the laboratory, found syphilitic changes in the lid, but no other carriers of the infection were discoverable. Wassermann and Landau's reaction were strongly positive. A noteworthy circumstance was the absence of the typical primary lesion.

SECONDARY STAGE MANIFESTATIONS IN THE LID

The skin of the lids enter into the skin eruptions of the secondary stage very little or not at all. Mucous patches of the conjunctiva, on account of their sometimes having a membranous appearance, are apt to be wrongly diagnosed as membranous conjunctivitis.¹² The conjunctiva very rarely may be the seat of mucous patches. However, recently Hanford McKee reported such a case in which he was able to demonstrate the *Spirocheta pallida*.¹³

The history of this case was as follows:

Patient, aged 25 years, admitted to the hospital on account of a swelling on her right lower lid. Patient was very much emaciated, had a cough and was the subject of syphilis. She had a scar on her vulva, a rash had been present, but had now almost entirely disappeared. Glandular involvement marked. Her mouth was a mass of mucous patches.

The patient did not complain of any pain or unpleasantness about the eye, but it had been noticed to be slightly swollen one day previously. The eye was watery and the conjunctiva congested.

Upon pulling down the lower lid there was noticed upon the palpebral conjunctiva in its outer part, that there was an area of

11. Antonelli: Soc. d'Opht. de Paris, June, xx, 461.

12. Wood, C. A.: Interstate Med. Jour., October, 1909.

13. McKee, H.: Ophth. Rec., February, 1909.

quite a different color from the rest of the conjunctiva. The peculiar blue hue contrasted so plainly with the reddened conjunctiva that the whole border of the patch was very definitely shown. Somewhat oblong in shape, it extended from the middle fourth to the outer canthus, and from the edge of the lid to the fornix. The diagnosis clinically was a mucous patch on the conjunctiva.

The diagnosis was fully confirmed from microscopic demonstration of the *Spirocheta pallida* from the scrapings of the patch.



Figure 1.

Patient put on antisyphilitic treatment, no local remedies being applied to the conjunctiva and the case got well rapidly and cleared up completely.

In the secondary stage syphilitic fissure of the external canthus may occur. Rupia have also been described involving the lids. In tertiary syphilis, it has been well said,¹² that the only way to avoid errors is "eternal vigilance." One or both eyelids in one or both eyes may be attacked. The most common form of palpebral tertiary involvement is tarsitis.

Without pain the lid becomes slowly and gradually hypertrophied and the integument tightly stretched and hyperemic. On palpation which gives no pain the tarsus can be felt to be enlarged and of cartilaginous density. Ptosis is often well marked and the eyelashes fall out.

Under treatment the infiltration disappears and leaves a normal eyelid behind, or the tarsus may be somewhat atrophied as a result of the inflammatory process. The edema and redness of



Figure 2.

the skin of the eyelid, resemble very closely the symptoms found associated with a chalazion or hordeolum. Unless the edema is recognized as a valuable symptom found in association with a specific tarsitis, one is apt to use the knife in an exploratory incision for some focus of pus and it is surprising how often one can elicit the history of the lesion having been incised for suspected hordeolum.

The following cases illustrate very adequately the salient features of specific tertiary tarsitis.

The first is by Dr. Harry Gradle who reports a case of specific tarsitis¹⁴ occurring in a female who gave a definite specific history. Tarsus enormously swollen and because of a feeling of fluctuation that was present an incision was made in the hope of finding fluid. None was found. Antisyphilitic treatment ineffective until after three months and at the end of five months the case was cured.

Dr. A. C. Sautter¹⁵ also records a case which illustrates these points.



Figure 3.

The patient was a colored man, aged 25 years, the victim of malignant syphilitic infection. There was an early diffuse (probably) gummatous infiltration of the tarsus and the adjacent glandular tissue. Ten weeks after the primary sore in the usual location he came for treatment of what seemed to be a chalazion in the left lower lid. An incision was followed by some bleeding but no discharge of secretion. The lesions then successively involved the upper left and right lower lids. While in the lower

14. Gradle, Harry: *Ann. Ophth.*, October, 1909.

15. Sautter, A. C.: *Min. Coll. Surg. Philadelphia*, January, 1911.

lids the swellings resembled chalazia, in the left upper lid a diffuse inflammatory swelling occurred associated with some pain and tenderness and preauricular glandular involvement. The conjunctival surface of this lid presented shallow ulcerations, also a larger marginal ulcer and a number of subconjunctival lardaceous infiltrations.

The patient had been under mercurial inunctions for the past three months, with slight improvement. I gave an intravenous injection of salvarsan which was followed by rapid improvement and retrogression of all lid lesions. The case on clearing up left slight marginal swellings of the tarsus; also at the site of the former marginal ulcer of the left upper lid there was a roughened area devoid of cilia. The other lids were normal.

The following case occurring in our practice well illustrates the difficulties in diagnosis of tarsitis luetica:

Complaint.—Upper lid red and swollen.

Duration.—Five months.

History.—First noticed the upper lid of the right eye to be swollen. This soon became red and markedly edematous. At the lid margin soon noticed a small swelling which broke down into an ulcer which had a nibbled punched-out appearance. There has never been any pain. He had been treated by a very able colleague who incised the lid without finding any fluid or any material benefit.

An examination of the patient at the time he came to me showed considerable edema extending all over the upper lid to the upper part of the orbit. This edema caused a ptosis of the lid which was quite noticeable. Midway between both canthi on the ciliary border of the lid was a small indurated ulcer. This ulcer was about the size of a small bean and looked unhealthy and was of a chronic nature. It had remained in this condition for several months. One thing of note was the definite absence of cilia corresponding to the ulcerous area.

From the appearance of the lid and the chronic appearance of the small ulcer we suspected some underlying general condition to be the cause of his eye trouble, and a tentative diagnosis of specific tarsitis was made. Was able to elicit the history of the patient having a hard chancre in the usual location about fifteen years previously. Also shortly after this infection the patient had sore throat and this was followed by regurgitation of fluids through the nose and difficulty in swallowing.

A Wassermann made the day after I first saw him gave a 4+ reaction. Administered salvarsan three days later, followed with mercurial inunctions and potassium iodid. From this time on his eye condition began to improve rapidly, and soon all evidence of the disease disappeared, with the exception that it left as a sequela some entropion and at the site of the ulcer, there was an absence of cilia as well as a punched-out scar with more or less obliteration of the usual intermarginal border.

Sydney Stephenson¹⁶ reports a case of tubercular iodism simulating gumma of the eyelid. The patient had a lesion of the lower lid presenting all the appearances of a gumma. Patient had been under treatment for lues for about one year. Had been treated with 30 grains of potassium iodid three times a day.

Remarks.—Of the various skin lesions that may on occasion follow the internal administration of potassium iodid, that described in the present communication is probably the rarest.

The breaking down of the lesion is so similar to gumma that according to Stephenson two patients have been dosed into their graves by the pushing of the very drug which was the original cause of their trouble.

Not all cases of specific tarsitis occur in adults. Feuer¹⁷ reports a case of congenital tarsitis in an infant three months, the subject of hereditary lues. The swelling was so intense that the upper lid edge reached the margin of the lower orbital wall. Autopsy showed congenital lues.

In the tertiary stage Luedde¹⁸ emphasizes the difficulty of diagnosis between gumma situated at the inner canthus and dacryocystitis. He mentions a case where irrigation showed that the lachrymal passages were clear. Condition not improved by operation. Lues suspected. Case cleared up on administration of large doses of potassium iodid.

The cases I have endeavored to report are typical cases which I have selected from literature in order to illustrate the varied forms in which lues may manifest itself in the palpebrum.

Concerning the laboratory aids in diagnosis, I have mentioned the examination for the spirochete and the Wassermann reaction. To these we might add the luetin test, which though not likely to yield a positive result in primary or secondary syphilis, often can be used in the tertiary stages to clinch a diagnosis, where the Wassermann has proved negative. Here we might

16. Stephenson, Sydney: Ophthalmoscope, xii, 406.

17. Feuer: Ung. Med. Presse, No. 20, 1898.

18. Luedde: Am. Jour. of Ophthal., January, 1912.

emphasize the well-known fact that in the late tertiary stages the Wassermann reaction is only obtained in about two thirds of positive cases. This is the place where the luetin test is really of value as a supplementary aid in the diagnosis.

Referring again to the Wassermann, I might mention the fact that in the primary stage the average time before this reaction can be obtained is the third week; hence here the only laboratory aid in the diagnosis is again, as mentioned above, the search for the spirochete.

In conclusion, we may briefly summarize as follows:

1. Syphilis of the eyelids, although relatively a rare affection, occurs with sufficient frequency to justify our serious consideration.

2. From 3 to 5 per cent. of all extragenital primary affections are on the eyelids. The sources of infection are various, through kissing, removing foreign bodies with the tongue, etc. In this connection it has been well said that the sources of infection are as various as the possibilities for placing the spirochete in contact with the eye.

3. The clinical diagnosis is oftentimes perplexing. We must observe unrelentingly its differential aspect, holding well in mind that it simulates hordeolum, chalazion, tuberculosis, vaccine pustule, etc.

4. A chronic indolent lesion of the eyelid with which is associated an enlargement of the preauricular and submaxillary gland justifies a tentative diagnosis of specific involvement, and is an indication for a strict interpretation of any possible underlying specific disturbance. We should be remiss in our fullest duty in these cases if we failed to employ such well-known laboratory methods which could have a clarifying effect on the situation.

5. The three essential laboratory aids in diagnosis, in order of value, are the Wassermann, the search for the spirochete and the luetin test.

6. Under the head of prognosis and treatment we wish again to emphasize that the intravenous injection of salvarsan stands in the first rank, supplemented by inunctions of mercury and last but not by no means least the use of potassium iodid in liberal doses.

7. It has been well said that when the cornea participates in the process, the prognosis is much graver. By a timely recog-

nition of the character of the disturbance much can be averted and what is very important, we can spare ourselves the negative effect of an uncertain wavering and mistaken diagnosis.

DISCUSSION

DR. H. S. GRADLE, Chicago: I wish to put on record a case, in addition to those that Dr. Alter has described. A physician came to me with the diagnosis of suppurating chalazion of the left lower lid. Both eyelids were edematous; near the inner canthus on the lid margin was an 8 to 10 mm. suppurating area with a hard base; the preauricular glands were slightly enlarged, and the submaxillary glands were markedly enlarged. A dark-field illumination examination revealed the presence of innumerable active *Spirocheta pallida*. Salvarsan was immediately injected and mercurial inunction started. The salvarsan was repeated weekly for six doses, although the lesion disappeared without local treatment within ten days after the first salvarsan injection. The infection was contracted during the curettage of an ethmoid when the patient coughed forth some bone particles that struck the doctor's eyelid. The fact should be emphasized, as Dr. Alter has said, that the diagnosis must be made with the microscope. The Wassermann reaction is of no value as the body has had no time to produce antigens. Any ulceration of the lid margin with glandular involvement demands an examination of the secretion with dark-field illumination, the only positive method of immediate diagnosis of chancre of the lid.

DR. F. PARK LEWIS, Buffalo: There is no doubt that tertiary manifestations of syphilis involving the palpebrae are rare. I have at present under observation, however, a gumma involving the connective tissue in the upper lid and presenting a very interesting question of differential diagnosis. The case, that of a woman in middle life, came with a history of a slowly increasing swelling with a doughy feeling and dark red appearance of the skin, which was presumed to be a deep abscess. The surgeon in charge incised it only to release a small amount of jelly-like substance. Gradually a second swelling appeared in connection with the first extending under the tissues of the orbit. On deep probing the exposed bone of the supra-orbital ridge could be discovered. It had all the appearance of a frontal sinus infection, but this was excluded by reason of the fact that there had been no involvement of the inner nasal structures and the translucency of the sinus. There was present, however, a large specific ulcer in the throat which was found to be swarming with spirochetes. The case is rapidly recovering under the administration of salvarsan.

DR. J. B. JOBSON, Franklin, Pa.: In the diagnosis of syphilis, every sign and every symptom should be investigated carefully, and due valuation put on each. Modern microscopical or biochemical diagnosis should not be used absolutely to replace careful clinical investigation, and appraisalment of every lesion within reach of touch and sight. Even the expert might mistake the spirochete *refrigerens* which occurs in lesions about the mouth and eyes for the *Spirocheta pallida* of syphilis. And it is a known fact that a Wassermann positive may be obtained after chloroform or ether anesthesia or the administration of chloral. A few diseases other than syphilis may give a Wassermann reaction. With these facts in mind it is obvious that though the Wassermann reaction and microscope are exceedingly valuable aids in the diagnosis of syphilis, they have their limitations.

DR. WILLIAM WILDER, Chicago: I wish to compliment Dr. Alter on his excellent presentation of this subject. We are often confronted by an obscure lesion, the diagnosis of which is not made because one does not fully realize that syphilis frequently invades this limited field in which we are constantly working. The reason I discuss this subject is that it has occurred to me within a year to see another case of primary lesion of the lid. Unfortunately, this was in a physician, a throat and nose specialist, who probably contracted the infection by a patient coughing in his face. The lesion appeared near the inner angle of the left upper lid on the palpebral conjunctiva. These primary lesions do not have that peculiar appearance which characterizes infection of the mucous membrane of the genitalia. In this case as usual there was the typical bubo of the submaxillary glands. The spirochete was not at first discovered. Such lesions may be confounded with tuberculosis or Parinaud's conjunctivitis, and one should not forget the possibility of infection with sporothrix in which as in Parinaud's disease there will be swelling of the neighboring lymph glands. Cases of sporotrichosis of the conjunctiva have been observed in France more frequently than here, but they occur occasionally here and they look wonderfully like an initial lesion of syphilis; so it might be well in any case to make a smear and inoculate a tube of dextrose agar when the characteristic fungus will be discovered. This case in a subsequent examination showed the spirochete, and the case went on to recovery. It emphasizes also the importance to the man who sees a great many cases of throat and nose disease, to have a proper screen between him and the patient. As Dr. Gradle says, we should not place implicit faith in the Wassermann test, for the reason it is not positive at so early a stage, and many of us have become more or less prejudiced as to the value of the Wassermann for frequently a positive reaction has been absent in cases we know must be syphilis. Even if it is negative at first, a few days later it may be positive. As to the treatment, it has been my experience that we can get pronounced results from the use of salvarsan.

DR. E. B. HECKEL, Pittsburgh:—Two cases of tertiary lesion of the eyelids were reported, one in a young man who developed a gumma of the right upper eyelid at the temporal side. The case was not seen until a decided slough had resulted, involving the entire thickness of the lid and in an eventual ectropion which was corrected later by a skin graft. This case occurred before the day of the Wassermann reaction. The clinical picture, however, was typical and the healing rapid and positive under specific treatment. The second, a young woman with a gumma of the left upper eyelid at temporal side. This case also resulted in a complete sloughing through the entire thickness of the lid, with an eventual decided ectropion, and which is now being corrected by a skin graft. The second case was clinically typical and the laboratory finding positive. A striking feature of these two cases is their symmetrical location in the lids.

DR. ALTER (closing discussion):—I was much pleased with the interest manifested in this paper, which is a subject of considerable importance. The thing we tried to emphasize was the difficulty of diagnosis. Many of these cases are overlooked. I recall two or three cases diagnosed as something else that very likely were of a specific nature. Dr. Jobson was quite right when he said we should not overlook the value of the clinical data in these cases. We hope that we did not overstate the value of the laboratory aids; what we tried to emphasize is the real value of the laboratory tests to strengthen and make clear our clinical evidence. Another point that we wish to emphasize in these

cases is the glandular involvement. It is of a painless character and present practically in all cases. When we find it in a case of chronic indolent ulcer of the eyelid, we can accept it as giving very trenchant supplemental diagnostic aid. It may not be amiss (since this is such an important symptom) to briefly consider all eye conditions in which we find adenopathy, thereby availing ourselves of the aid such a summary gives in its differential aspects. The conditions in which we find adenopathy are as follows:

1. Parinaud's conjunctivitis has as one of its classical symptoms an enlargement, even to the extent of suppuration, of the preauricular gland. Its semitranslucent vegetations, superficial ulcers, etc., render a differential diagnosis of easy solution.

2. Lupus or tuberculosis of the lid, which is also associated with lymphatic involvement, can be distinguished by its superficial nature, and its tendency to heal in one area while spreading in another region. The enlarged glands, however, as a rule are painless, as in enlargement following lues.

3. Epithelioma: Here we have an involvement of the lymphatic glands and this enlargement is one of the distinguishing points between epithelioma and rodent ulcer involving the lids. There is usually considerable pain. Its most common location is the lid margin and the outer commissure. The occurrence of this growth has as its main differential characteristics, from lues, pain, and its occurrence in elderly people.

4. Hordeolum internum is not unfrequently associated with enlargement of the preauricular or even the submaxillary gland. The outstanding differential feature here is that the enlargement accompanying hordeolum is painful, whereas in lues the enlargement is quite painless.

5. We have the acute processes to consider, such as gonorrheal conjunctivitis, etc., but this is more apt to be in the nature of a bubo, and the nature of the acute process is such as to be readily distinguished.

6. Emphasis may again be made on the invaluable assistance given by the laboratory aids in doubtful syphilitic affections of the lids. Their order of importance are the spirochetal findings, the Wassermann, and lastly, the luetin test. We employ old salvarsan intravenously, give the injections one month apart and usually two or three suffice. This is supplemented and reinforced by the well-known inunctions of unguentum hydrargyrum and potassium iodid in tertiary lesions, depending more, however, on salvarsan and rapid mercurialization.

REPORT OF THE COMMITTEE ON PROTECTION OF THE EYES IN INDUSTRIES FROM EXCES- SIVE LIGHT AND HEAT

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MILWAUKEE

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PITTSBURGH

Mr. President and Gentlemen of the Academy: Your committee in accepting the honor conferred upon them in being appointed to investigate the dangers to the eyes of individuals subjected to the harmful effects of intense light and to study the means of protection were aware that they had no small task set them, but did not fully appreciate the breadth and scope of the undertaking until they began to investigate the subject more carefully, and we are free to confess we were astounded by the magnitude and intricacies of the work and can at this time only outline what has been accomplished (which is very little) and state what we plan to do (which is extensive).

Although we have been unable to accomplish as much as we should liked to have done, we are in position to give valuable information to any manufacturing plant as to the means and manner of protecting the eyes of their employees from injury resulting from exposure to intense light sources and at the same time allow the vision necessary to enable them to carry on their occupations and to see to move about without removing the protection from the eyes, which latter with many of the older methods of eye protection was impossible.

We plan to make a final report (if it is the wish of the Academy to accept this preliminary report and continue the present committee) such that a physician or physicist may turn to it and give any manufacturer preventive advice regarding the protection of the eyes of his employees.

The effect of certain portions of the spectrum of radiant energy have been definitely proved to be injurious to the unprotected eye if of sufficient intensity. Different portions of the spectrum differ in their action upon the ocular tissues.

As all the radiations emanating from an incandescent body are not perceived by the visual apparatus, the spectrum is

divided into the visible and invisible spectrum. The visible spectrum includes those radiations between wave lengths about 700 microns and 400 microns. That portion of the spectrum having wavelengths longer than 700 microns is known as the infra red spectrum, and the portion having wavelengths shorter than 400 microns, is known as the ultra-violet spectrum.

THE VISIBLE RADIATIONS

Verhoeff and Bell¹ state "they have found that no artificial source of light used for illuminating purposes contains enough ultra-violet radiation to involve the slightest danger to the eye from its effects under any readily conceivable condition of use." Considered from the point of view of their investigation which was to determine if destruction of tissue would result from exposure of the eyes to the radiation emanating *from ordinary artificial light sources*, the above statement is true, and has long been known. However, they do not mention the fact, which is not by any means universally appreciated, that the unhygienic use of artificial illumination does result in diminished visual acuity and in manifest ocular discomfort. Nor neither do they say what the ultimate effect of continued improper use may be.

It has undoubtedly been the observation of every one, that after looking with the unprotected eye directly at any source of light even of moderate intensity for a few seconds, to experience a painful, dazzling sensation usually followed by an after image which frequently interferes with the ability to see distinctly for a short time. If the source is more intense, such as is experienced when one looks into the fire box of an engine or the electric head-light of an automobile or approaching locomotive, there is in addition to the pain and dazzling an absolute blotting out of the central vision or scotoma formation until the eye recovers from the effect.

The pain experienced when bright light impinges upon the unprotected eye is undoubtedly due to the convulsive effort of the muscles controlling the iris to reduce the pupillary aperture sufficiently to exclude the excess of light, the pain resulting not so much from the initial act of reducing the size of the pupil as from the continued effort of holding it in a contracted state. This muscular effect is a reflex act, secondary to the stimulation of the end elements of the optic nerve. The more intense the initial stimulus, the more strenuous the reflex act. This is the

1. Verhoeff and Bell: Sci., Sept. 25, 1914.

effect of the radiations within the visible spectrum and probably some of the longer wave lengths within the ultra-violet spectrum. The ultra-violet rays are partially absorbed by the lens and converted into rays of greater wave length which reach the retina and reflexly act upon the pupils. The infra-red rays seem to have but little effect upon the pupillary control, although Reichen² in studying the effects of relatively short infra-red waves upon the eyes of rabbits, the visible and ultra-violet radiation being absorbed by a solution of iodine carbosulphid showed these rays caused an irritation of the iris in pigmented irides as evidenced by contraction of the pupil lasting several hours.

The dazzling is accounted for as being the effect of overstimulation of the cones of the macular and paramacular region of the retina due to the excessive amount of the products of decomposition of the visual purple from its rapid breaking up by the intense light.

According to the now generally accepted theory of vision,³ when the products of decomposition of the visual purple are present in the fovea, it is the most sensitive portion of the retina; when none are formed it is blind.

The temporary blotting out of central vision and resulting scotoma is probably the effect of the complete using up of the products of decomposition of the visual purple in the foveal region for the time being, the cones being insensible to light stimulation in the absence of visual purple, or rather, to its products of decomposition.

Another probable factor which interferes with vision is the absorption by the lens of the eye of the rays of short wave lengths from the light source. This absorption begins in the blue of the visible spectrum and extends far into the ultra violet. These rays are transformed into the different forms of energy, such as heat and a changed condition of radiation, which some bodies exhibit when subjected to light, known as fluorescence. The ultra violet of wave lengths from 400 microns to 375 microns are especially effective in producing fluorescence. This fluorescence has been shown to decidedly interfere with vision because of the fog it produces in the lens. What effect upon vision the infra-red rays have is still an unsettled question.

Nature has made provision in the retina for the rapid restoration of the visual purple. The absorbed energy which has been transformed into heat in the lens, is eliminated by diffusion into

2. Reichen: *Ztschr. f. Augenheil.*, xxxi, 20.

3. Elridge-Green: *Theory of vision*, *Ophth. Rec.*, September, 1914.

the surrounding fluid or aqueous humor, fluorescence is probably dissipated by being absorbed into the adjacent tissue; as a result, if the exposure to light source has not been too prolonged, or the source itself too intense, the interfered with vision is quickly restored.

Eclipse blindness, according to Verhoeff and Bell, is due to the action of concentrated heat on the pigment epithelium of the retina and the choroid, this heat being almost wholly due to radiation within the visible spectrum in which the maximum solar energy lies.

THE INFRA-RED RADIATIONS

Ninety-five per cent. of all the energy radiated from artificial illuminants or from furnaces is infra-red energy. In sunlight only about 50 per cent. of the energy is in the infra red, consequently sunlight does not call for the same character of protection as artificial incandescent bodies. Verhoeff and Bell maintain any effect upon the eyes due to infra-red rays is simply a matter of thermic action, and that such rays are in the main absorbed by the media of the eye before reaching the retina.

A nonmedical authority who has for years been in a position to observe the effects upon the eyes of constantly looking at molten glass states: "Glass blowers' cataract in my opinion is an absurd myth, but I believe, from long observation, that glass workers experience noticeable discomfort from constantly looking at the molten metal and tend to injure their vision unless wearing protective glasses which eliminate most of the infra-red radiations and probably also reduce the intensity of the visible spectrum somewhat." This is substantiated by the findings of Sir William Crookes⁴ who states: "The heat rays are very strong, and if injury to the eyes is caused by exposure to radiation from molten glass, a protective glass should be opaque to the infra-red rays. These being present in the molten glass in far greater abundance than the ultra-violet rays, the inference is that it is to the heat rays rather than to the ultra-violet rays that glass workers' cataract is to be ascribed." He also advises reducing the intensity of the "purely luminous rays" by means of a neutral or gray-tinted glass.

Vogt has observed that the crystalline lens is the greatest obstacle in the human eye to the passage of the infra-red rays, and are considered by him to play an important rôle in the etiology of glass blowers' cataract. A later observation by Vogt

4. Crookes, William: *Phil. Tr.*, Series A, 1914, ccxiv.

is that the iris is the greatest factor in absorbing these radiations. Reichen was unable to produce opacities in the lenses of rabbits visible with the ophthalmoscope by subjecting the eyes to the relatively short-waved infra-red radiations.

THE ULTRA-VIOLET RADIATIONS

There are but few other subjects in the domain of ophthalmology over which there is such a difference of opinion as the question of the injurious effects of ultra-violet radiations. To them has been ascribed almost every ill the eye is subject to, from photophobia to atrophy of the optic nerve. However, it has been definitely proved that ultra-violet light does have injurious effects upon certain tissues of the eye. Photophthalmia is a recognized result of exposure to light rich in ultra-violet radiation, nor does the exposure have to be of long duration; a flash, the result of a "short" in a high voltage electric current, will bring about a severe reaction; again, constant or intermittent exposure of the unprotected eye to less intense ultra-violet light will result in the same condition, the effect being cumulative. The transformation of ultra-violet radiation into longer wave lengths in the production of the phenomenon known as fluorescence, which takes place in the cornea, lens and vitreous humor is apparently Nature's method of protecting the retina from the injurious effects of ultra-violet light. This fluorescence, however, tends to fog vision and also brings about pupillary contraction, reflexly, through its action upon the retina. As stated by Sir William Crookes: "That the ultra-violet rays act on the deeper-seated portions of the eye is shown by the intense fluorescence of the crystalline lens induced by these rays." It seems now established that fluorescence is at its maximum in the region of wave length 375 microns to 400 microns or in the longer wave lengths of ultra-violet light, while the wave lengths shorter than 350 microns are injurious to living tissue, although Verhoeff and Bell state: "Abiotic action for living tissue is confined to wave lengths shorter than 305 microns, at which length abiotic effects are evanescent, while for shorter wave lengths they increase with considerable rapidity." They also state: "The abiotic energy in the solar spectrum is a meager remnant between wave lengths 295 microns and 305 microns, aggregating hardly a quarter of 1 per cent. of the total. At high altitudes and in clear air it is sufficient, however, to produce slight abiotic effects, such as are noted in snow blindness and solar erythemia."

The rôle of ultra-violet light in the protection of cataract was about gasping its last breath when the recent work of W. E. Burge at the Nela Research Laboratory gave it a new and probably lasting lease of life. Burge exposed free-swimming organisms, paramecia, to the radiation from a quartz mercury burner and observed them under the microscope during exposure. These organisms are fairly transparent and are just visible to the unaided eye. During the exposure they moved more and more slowly and gradually because more granular and opaque. After twenty or thirty minutes the organisms were dead. As exposure of egg white to ultra-violet radiation caused it to lose its transparency and to become an opaque mass, so the exposure caused the living material or protoplasm of these organisms to coagulate and to become an opaque. The conclusion may be drawn that ultra-violet radiation injures or kills living cells by coagulating or rendering insoluble the protoplasm or living material of the cells.

"Experiments were carried out in an attempt to determine the mode of action of ultra-violet radiation in coagulating or rendering insoluble the protein of cells and to determine the specific wave lengths in the quartz mercury arc active in this respect. A normal excised crystalline lens was placed between two quartz plates and pressed into a thin layer by squeezing the plates together. By means of a quartz spectrograph the spectrum from a quartz mercury burner operating at 70 volts and 800 candlepower was focused on the layer of lens material. This layer of material was almost perfectly transparent. The exposure was made for 100 hours. At the end of this time there was no visible change in the material. It was as transparent as at the beginning of the experiment. However, when the preparation was immersed in a 0.1 per cent. calcium chlorid solution four bands of coagulated lens protein appeared where the bands of the spectrum had been focused.

"A similar preparation was made, except that the lens was soaked in a 0.1 per cent. solution of calcium chlorid for several hours previous to being pressed between the quartz plates. The spectrum was focused on this layer of lens material just as it had been focused on the layer of normal lens material. After fifteen hours of exposure nine bands of coagulated lens material could be seen where the corresponding bands of the spectrum had been focused.

From these experiments it would seem that calcium salts in some way make it possible for ultra-violet radiation to precipi-

tate protein. It would seem that ultra-violet radiation acts on the protein in such a way that calcium salt can combine with it and form a precipitate or coagulum. Magnesium salts and silicates have the same effect as the calcium salts.

"Analyses of human cataractous lenses from America show a great increase in the salts of calcium and magnesium and those from India show in addition to these salts silicates. I am told that silicious earth forms a part of the diet of certain classes in India. This may account for the silicates in the cataractous lenses from there. Cataract is of very common occurrence in India. Tropical light is comparatively rich in ultra-violet radiation. To explain the prevalence of cataract in India, the assumption is made that the relatively great amount of ultra-violet radiation in tropical daylight acts on the lens protein in such a way that the silicates in the eye media can precipitate it and produce an opacity. To explain the prevalence of cataract among glass blowers, the assumption is made that the eyes of glass blowers are subjected to more of the short wave lengths than the eyes of people generally, and for this reason the protein of the lens is modified and if such substances as salts of calcium, magnesium or silicates are present in sufficient concentration the protein will be precipitated and the lens rendered opaque or cataractous. The glass blowers who develop cataract form a relatively small percentage of those engaged in that occupation. Since the eyes of those who do and those who do not develop cataract are exposed to the same quality and quantity of radiation from the furnaces, it is assumed that those who do develop it have a disturbed condition of nutrition expressing itself in an increase of those substances which can precipitate the protein of the lens acted on by ultra-violet radiation.

"Ultra-violet radiation kills living cells and tissues by changing the protoplasm of the cells in such a way that certain salts can combine with protoplasm to form an insoluble compound or coagulum. The effective region of the spectrum in coagulating the living material of the cell or protoplasm is between 294 microns and 302 microns. The most effective region is around 254 microns in case of the mercury arc used.

"An opacity of the lens or cataract can be produced in fish living in solutions of those salts found to be greatly increased in human cataractous lenses by exposing the eye of the fish to ultra-violet radiation. This can not be done with fish living in tap water."

ABSORPTION OF ULTRA-VIOLET RAYS BY THE OCULAR MEDIA

According to Lindale⁵ photographs of the spectrum taken through layers of tears collected from various normal individuals show constant absorption of ultra-violet light, slightly different in different individuals. Absorption begins at 300 microns, increasing gradually, declines at 250 microns and then increases rapidly. A layer of tears 0.1 mm. thick absorbs at 250 microns, 15.4 per cent.; 240 microns, 33.7 per cent.; 335 microns, 55 per cent. The absorption is dependent upon the albuminoids of the tears, and can be eliminated by coagulation with acetic acid or heat.

According to Parsons, the absorption of the ocular media is as follows: The cornea all wave lengths shorter than 295 microns. The lens all wave lengths shorter than 350 microns. The vitreous all wave lengths shorter than 280 microns.

PROTECTION AGAINST THE INJURIOUS EFFECTS OF LIGHT

The problem of eye protection in processes involving intense light and excessive amounts of invisible radiation (infra red and ultra violet) must be considered from two points of view. The infra-red radiation, which from its thermic action produces drying of the cornea and if tears be insufficient and the eye not winked frequently enough irritation and roughening of the cornea, and is also considered a factor in producing cataract, should be eliminated. The ultra-violet rays, which produce irritation and severe inflammation of the ocular coats of the eye, fluorescence of the ocular media, which are also according to Burge an etiologic factor in cataract formation under certain conditions, must be screened from the eye. Besides this the retinal image must be reduced with safe brightness to prevent the resulting scotoma, as well as to eliminate the glare effects, which markedly interfere with visual acuity. This must be accomplished without reducing the ability to distinguish details to too great an extent, or an element of danger from inability to see is introduced.

INDUSTRIES IN WHICH PROTECTION FROM EXCESSIVE RADIATION IS NECESSARY

This portion of the subject falls under two heads which are very closely allied.

⁵ Lindale: Läkareför. Förhandl. Neuefolge, xviii, 416. Reviewed in Arch. f. Augenheilk., lxxv, 263.

1. Protection from excessive light within the visible spectrum.
2. Protection from excess of invisible radiation. •

Under the first heading are:

Furnaces—	Approx. Temp., F.
Glass	2400°
Iron and Steel—	
Metal at tuyers (B. F. 'S.).....	3500
Metal at tuyeres (B. F. 'S.).....	2300-2800
Open-hearth furnaces. Flame.....	3400-3600
Bessemer converter	3400-3600
Open-hearth metal in ladle.....	2800-2900
Bessemer	2800-2900
Soaking pits—reheating high carbon.....	2200
Gas-heating furnaces	2400-2800
Large gas-heating furnaces.....	2900-3200
Electric	
Cement	
Fire boxes of locomotives.....	

According to Davies⁶ there is a steady stream of sparks of sufficient intensity to cause retinal asthenopia the result of grinding steels containing a high percentage of carbon or manganese.

Headlights: Automobile, electric, locomotive, street cars.

Occupations in which not only protection from intensity is necessary but also protection from the injurious effects of the invisible radiation.

Welding Processes—	Approx. Temp., F.
Thermit	4500
Oxyhydrogen flame	3600
Oxyacetylene flame	4350
Electric	6200
Electric under pressure.....	6450

ELECTRIC ARC EXPERIMENTATION

There is, however, to be taken into consideration that much depends upon the true estimation of color values in certain of these industries, and a glass cannot be used which while affording adequate protection will interfere with the recognition of colors. For instance protective glasses for enginemen and firemen must be such as will not interfere with the recognition of the red, green and yellow night signals. Also, in certain processes in the making of steel the color is a determining factor. It is true that in the above process practically any glass that will afford sufficient protection will change the color values somewhat and it will be necessary for the wearer to readjust his estimation of them to the changed condition.

6. Davies: Ophth. Rec., October, 1915.

Investigation of the properties of a number of the colored glasses on the market by spectroscopic analysis has seemed to indicate conclusively that some of these, heretofore reputed to possess various desirable qualities, are actually of but little more value as a protective measure for the use intended than clear glass.

Ordinary spectacle glass offers no obstruction to the ultra-violet rays as short as 350 microns when absorption begins; at 300 microns wave length 25 per cent. of the ultra violet is passed and at 290 microns wave length 8 per cent. is passed, beyond which region absorption is complete.

Smoke glass differ greatly in their absorption characteristics for ultra-violet rays, and while their transmission for the rays of the visible spectrum may be very slight, it is no safe criterion upon which to judge their absorption properties for ultra violet. The same may be said of blue glass which is one of the most common of the "ordinary colored glasses." Cobalt blue glass is more transparent to ultra-violet radiation than clear glass of the same thickness.

The abiotic rays from intense light sources transmitted by such glass can be borne without danger for a few minutes, but do cause decided irritation from their cumulative action. For prolonged exposure such protection is absolutely futile. It is therefore imperative, in order to insure safety, that a glass which absorbs to a certainty all the ultra violet be used when the eyes are exposed to light rich in ultra-violet waves for longer than a few moments at a time.

Glass in which the color tends towards a yellow or yellowish green shows an increased absorption power for ultra violet, as is shown by the spectrograms for amber, euphos, fieuzal, akopos and Noviol glass.

According to Luckiesh,⁷ color values are distorted less and the relation of the temperature and luminosity for black and gray bodies is practically the same through a yellow-green glass as to the unobstructed eye.

Deep red glass is an effective protection against dangerous radiations and is in general use in arc-welding processes in which it is combined with yellow, blue or green and blue glass. The objection to the use of such a combination is the inability to distinguish detail and to see to get about also the increased weight of using two or more pieces of glass.

7. Luckiesh: Glasses for Protecting the Eyes in Industrial Processes, Tr. I. E. S., ix, No. 5.

Amber, euphos, fieusal, akopos and Noviol glass which show more or less complete absorption for the ultra-violet radiation must be impregnated with some material which will reduce to a marked degree the intensity of the light used for protection in such work as arc experimentation, electric welding and other industries involving intense light. This glass must also have a high absorption for infra-red radiations. According to reliable information obtained from manufacturers of glass, all these absorptive characteristics can be incorporated in one piece of glass. Such being the case one layer of glass would afford ample protection without reducing the amount of light gaining entrance into the eye to an extent incompatible with good vision for detail.

So far we have merely endeavored to show that the eyes demand protection in certain cases against both an excess of light and against an excess of the injurious phases of light. This is based more upon the work of others than any original work of the committee. Our investigations have been devoted to the analysis of light emanating from various commercial sources by spectrophotometric measurements and to the determination of absorptive characteristics of the various commercial lenses judged from the standpoint of thickness and color. We are making spectrograms of the light in various forms of welding and of the light emanating from the various commercial furnaces; accompanying each spectrogram will be photometric measurements of the intensity of the illuminant indicated in foot candles. We have partially completed the analysis of the various forms of commercial glass with respect to their absorptive characteristics in the visible and invisible spectra.

From their incomplete measurements the committee feels justified in reporting:

1. The necessity of reduction in intensity of the various industrial sources of light among several classes: (a) Furnace men, iron and steel, railway firemen, glass, electric, cement. (b) Welders—gas, electric, chemical. (c) Arc experimentors.

2. For this reduction, it is necessary that there be a color element embodied in the glass, the density of which varies with the occupation. (Table to be compiled later.)

3. In certain industries, this reduction must be coupled with an absorption of the invisible radiations (infra red and ultra violet).

4. The present methods in vogue are aimed rather at a reduction in intensity than at selective absorption.

5 The absolute absorption of the invisible radiations, as far as possible, is essential, but hand in hand with this must be brought about a reduction in intensity based upon the character of the illuminant.

6. Extensive tables showing the various types of glass most advantageous for the various occupations will be published shortly by the committee.

NELSON M. BLACK, Chairman.

HARRY S. GRADLE.

EDWARD STIEREN.

DISCUSSION

DR. HARRY S. GRADLE, Chicago:—The report of the Committee on Protection of the Eyes in Industries from Excessive Light and Heat was supplemented at the afternoon session by a demonstration of the spectrograms of various colored glasses on the market by means of lantern slides. The absorption properties of the respective glasses in the visible and ultra-violet spectrum compared in each instance with the unobstructed spectrum of an iron carbon arc were shown. These spectrograms were made by Prof. L. R. Ingersoll of the University of Wisconsin, taken with Cramer spectrum plates, by means of a spectroscope mounted with a quartz prism and lens system, which offers no obstruction to the ultra-violet radiations.

The iron carbon arc with which these spectrograms were made consisted of an iron rod carrying the positive current, contacted at a right angle with a carbon rod carrying the negative current, the iron rod being above. The light emanating from such an arc is extremely rich in ultra-violet radiations and is met with in actual working conditions in the electric arc welding process, the intensity of the radiations being vastly increased as the voltage and amperage is many hundred times greater than the current used in making these spectrograms.

The position of the various wave lengths in the spectrum is shown by the numerals placed above the spectrum of the iron carbon arc, that is, 700 microns indicating the extreme red of the visible spectrum, and 400 microns the extreme violet, which is the approximate beginning of the ultra-violet radiations which have been studied as far as wave length, 180 microns. No attempt was made to include in the slides radiations shorter than wave length, 290 microns, as all ultra-violet radiations shorter than 294 microns are absorbed by clear or Crown glass and all colored glass has greater absorption properties than Crown glass.

Spectrograms of the following glass were shown:

Glass	Ultraviolet Absorbed Beyond Wave Length μ
Crown	294
Smoke No. 6	345
Smoke No. 7	350
Amber light	350
Amber dark	430
Radex	360
Fieuzal light	345
Fieuzal dark	380
Euphos medium	405

Glass	Ultraviolet Absorbed Beyond Wave Length μ
Euphos dark	410
Akopos medium	380
Akopos dark	405
Crooks No. 1	355
Crooks No. 2	355
Noviol light	404
Noviol medium	438
Noviol dark	472
Electric smoke	355
King's pugh	340
Wilson's cobalt blue	310
Wilson's welders	380
Noviweld medium	480
Noviweld dark	510

PERIMETRIC STUDIES OF THE NORMAL AND PATHOLOGIC BLIND SPOT OF MARIOTTE

LUTHER C. PETER, M.D.

PHILADELPHIA

Studies of Mariotte's blind spot have been made by Van der Hoeve, Hansell, and others, and they all have practically been in accord as to the approximate size and location of this blind area in the perimetric field. Van der Hoeve and Hansell measured the vertical diameter at 7 degrees and the horizontal at 5 degrees, and with few exceptions the blind spot has been located approximately at 15 degrees from the fixation center, and a little below the horizontal meridian. These figures, however, in the minds of most of us, do not take on concrete form because the blind spot is not charted on the campimeter or perimeter, and its location is indifferently marked out on perimetric charts by a small circle which bears no definite relation to its exact size. The inexperienced examiner, therefore, has nothing with which to measure or to determine abnormalities in the blind spot.

In the hand campimeter of the author¹ this difficulty has been overcome by definitely charting the average normal blind spot at a 16.5 cm. radius, the average having been drawn from several hundred examinations. The vertical diameter is 21 mm. and the horizontal is 15 mm. The average distance of the center of the blind spot to the center of the field of fixation is 45 mm. Reduced to degrees, by the rules of trigonometry, the blind spot is 7° 40' in vertical diameter and 5° 28' in horizontal, and the distance from the central fixation point to the center of the blind point is 15° 49'. Given these figures, it becomes an easy matter to definitely determine the size of the blind spot at a radius of 13 inches or one-third meter, at 1 and 2 meters, the distances usually employed, or at any other distance desired. At 13 inches or 33 cm., the blind area should measure 31.5 mm. by 44 mm.; at 1 meter 95.27 mm. by 133.41 mm.; at 2 meters, 190.54 mm. by 266.82 mm. The distance from the fixation center should be 9.3 cm., 25.8 cm., and 54.5 cm., respectively.

If care is observed to have the patient's head erect and the campimeter is properly in relation to the eye, the variations at

1. Peter: Ophth. Rec., July, 1915.

a 16.5 cm. focus are very slight indeed. The vertical diameter extends 2 degrees above the horizontal meridian of the chart and approximately 5 degrees below. This naturally can be made to vary by slightly tilting either the head or the campimeter.

In the size of the blind spot, possibly the greatest variations occur in the vertical diameter. In a few instances I have found the vertical diameter reduced to 5 degrees. In measuring the normal, and more particularly the abnormal blind spot, there is a tendency on the part of the patient to develop an enlargement on the nasal side of the disc. There probably are two reasons for this tendency. The retina between the macula and the disc undoubtedly is richer in rods and cones than the area to the nasal side of the disc, and as the test object is moved from the macula toward the periphery, the difficulty of recognizing colors increases. On the hand campimeter, for example, a disc of less than 2 mm. in diameter will hardly be recognized with any degree of accuracy beyond the 20 degree circle. A second factor in enlargements to the nasal side of the disc is the fact that the retinal nerve fibers are largely bunched on the nasal side, and although translucent in health, in edema of the disc from any cause, the rods and cones on that side may be unable to receive clear impressions because of the edema. The nasal edge of the blind spot therefore must be investigated with a great deal of care in order to determine the exact limits.

The second physiologic variation of the blind area will be found in the distance of the blind spot from the fixation center. The average distance is $15^{\circ} 49'$. In myopia this distance is increased. In high hypermetropia, on the other hand, the distance is somewhat less. The exceptions, as a rule, are at greater distance than $15^{\circ} 49'$, rather than the reverse.

In a study of the blind spot, most accurate results are obtained at a close range, especially in the study of colors. The average individual is neither so careful nor capable of making minute distinctions at 1 and 2 meters as at one-sixth and one-third of a meter. It is true the index of error increases as the distance of the eye from the board decreases, but to offset this error, color values are less distinct and the point of full saturation becomes more uncertain as the distance of the eye from the board increases. I have personally tried my own blind spot and the blind spot of medical men, who understand what is expected of them, at 1 and 2 meters, and have rarely been able to obtain uniform results. On the other hand, at a 16.5 cm. radius, little variation is noted and errors are more quickly corrected. Taking the

blind spot at 2 meters is difficult under the most favorable conditions, and accuracy is increased as the distance of the eye from the campimeter is diminished. The correctness of this observation has been verified by many examinations, not only of the blind spot, but of the color fields in the central zone as well. The studies which are incorporated in this paper, therefore, are based on examinations at a 16.5 cm. radius, or $6\frac{1}{2}$ inches.

Van der Hoeve and others found an area surrounding the normal blind spot in which there was a qualitative color change—an indistinct scotoma for colors. The area averaged about 1 degree in width. This observation I have not been able to confirm, either in studies of my own blind spot or in studies of normal individuals. Such a condition is possible when the examination is made at 1 and 2 meter distances, but the recognition of colors in discs small enough to make accurate and sharp discriminations at these distances is too uncertain to furnish trustworthy evidence. When this indistinct zone therefore is present at a radius of 16.5 cm., *it is valuable and conclusive evidence of pathologic change in the optic nerve.*

Careful studies in the normal individual show a blind spot sharply defined both for form and color and of the same size for form and colors. When, however, the optic nerve becomes the seat of disease, the first evidence will be found to be a qualitative color loss, second a quantitative loss, and finally absolute enlargement of the blind spot.

It is pertinent to inquire what is the real cause of an enlarged blind spot. Although it is a question large enough to form the basis of a future paper, a brief résumé is essential to complete this paper.

Van der Hoeve believes it means an involvement of the peripapillary bundle of nerve fibers wherever they are located. Fuchs believes the peripheral fibers of the optic nerve supply the retina immediately surrounding the disc, and the central fibers of the nerve supply the peripheral retina. It is well to bear in mind the fact that enlargements are, for the most part, concentric when due to retrobulbar conditions. If this be true, in accessory sinus disease it would argue against the peripheral arrangement of the peripapillary nerve fibers and would indicate a more compact bundle, most of whose fibers could be simultaneously involved. It is significant, too, that in most true toxic amblyopias there is a central scotoma and an enlarged blind spot, or a scotoma including the macula and Mariotte's blind spot. The peripheral field is rarely involved. This likewise would tend to locate the peri-

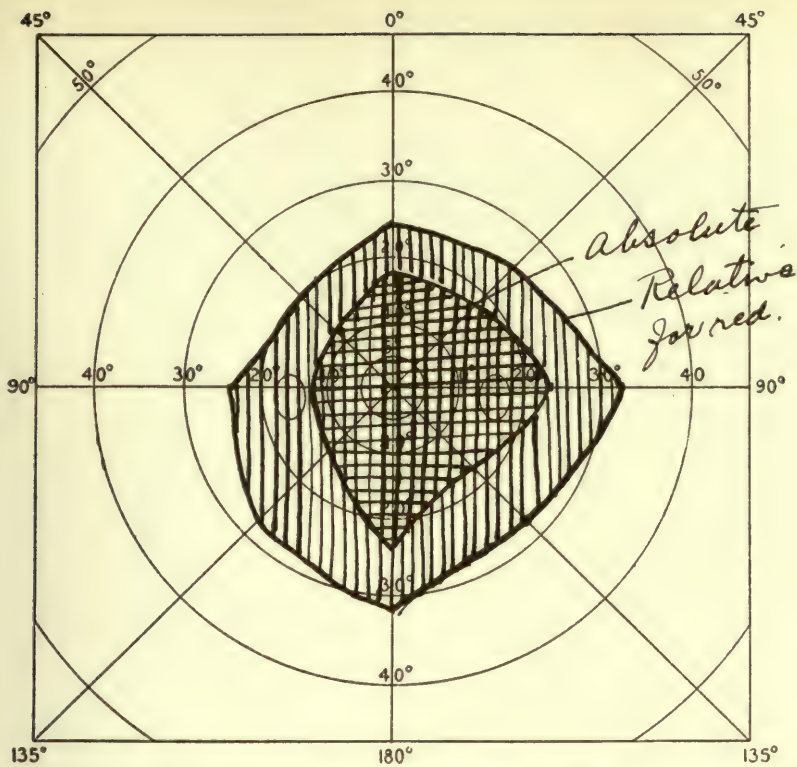


Fig. 1.—Coloboma of posterior pole of eye ball.

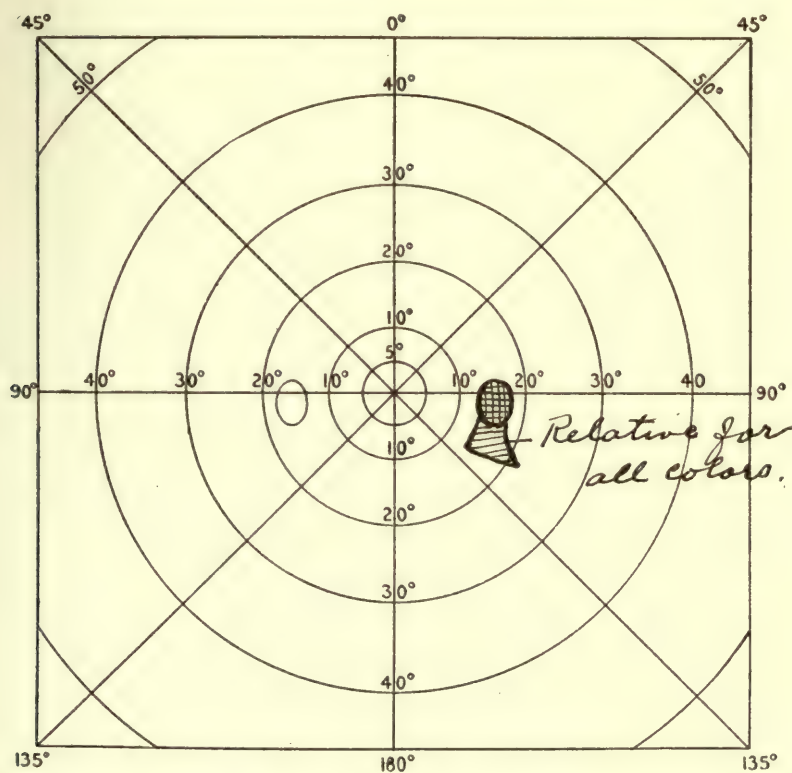


Fig. 2.—Enlargement due to opaque nerve fibers. Shows a relative enlargement of the blind spot for red and green, blue and white being normal in this area.

papillary fibers close to the papillomacular bundle. Clinical data seem to locate the temporal fibers of the retina in the temporal part of the nerve, and other parts of the retina in corresponding and definite parts of the nerve, even as far back as, and posterior to, the chiasm. It is probable, therefore, that in true retrobulbar neuritis, enlargement of the blind spot is due to involvement of the peripapillary nerve fibers, or to disease of the ganglionic cells which form a part of the neuron. Although anatomic and histologic investigation seems to confirm Fuchs' idea of the distribution of the peripapillary nerve fibers in the periphery of the nerve, clinical evidence does not conclusively confirm these findings. It is probable that the peripapillary bundle of fibers is located in the periphery of the nerve head, but their course in the remaining portion of the nerve is more or less in doubt.

Most enlargements of Mariotte's blind spot, however, occur from another cause, namely, intra-ocular changes immediately surrounding the optic disc. This is evident in chorioretinal conditions in which the peripapillary rods and cones are rendered incapable of receiving impressions by the chorioretinal disease. In papilledema, chronic nephritis and diabetes, the essential element is the edema which surrounds the disc. In myopia it is caused by a pulling away and atrophy of the retina and choroid in progressive stretching of the globe, and in commotio retinae the enlargements are due directly to the damage done to the choroid and retina.

General deductions which may be made from the studies of Mariotte's blind spot are: first, the average normal blind spot is $7^{\circ} 40'$ long by $5^{\circ} 28'$ wide, and is situated $15^{\circ} 49'$ from the fixation center, the upper edge extending about 2° above the horizontal meridian; second, physiologic and anatomic variations noted are (a) the vertical diameter may show shortening, and (b) the blind spot may be at a greater distance than $15^{\circ} 49'$ from the macula; third, the pathologic blind spot first shows a zone of qualitative color loss, second a relative enlargement, that is, for colors, and finally an absolute enlargement.

Given these facts, a study of the blind spot in pathologic conditions becomes easy and of great value as an aid in diagnosis.

SOME OF THE CONDITIONS IN WHICH THE BLIND SPOT MAY BECOME ENLARGED

Congenital Conditions.—Of the special conditions in which the enlarged blind spot may be found, the congenital malformations worthy of note are colobomata and opaque nerve fibers.

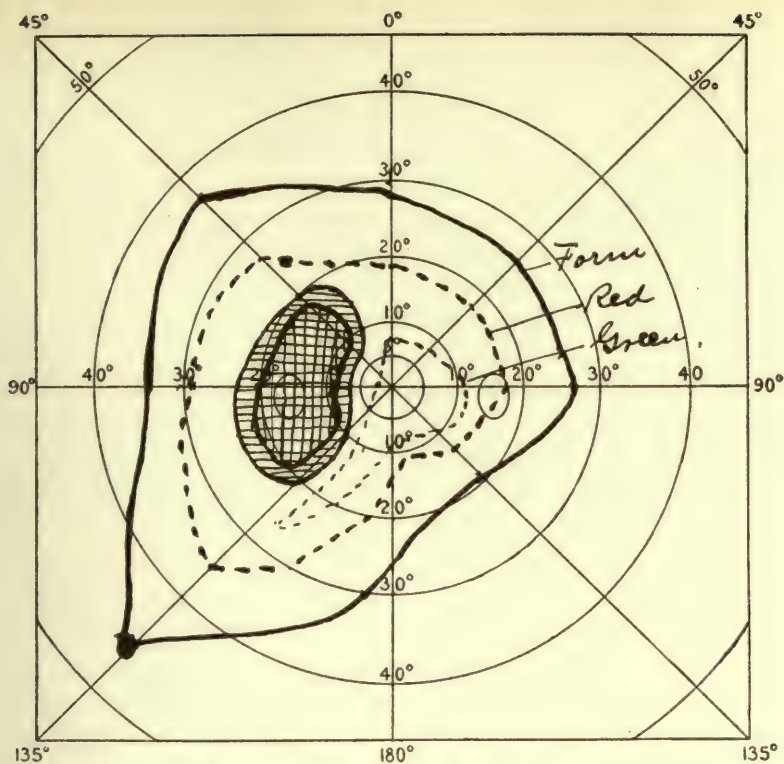


Fig. 3.—Enlargement due to high myopia.

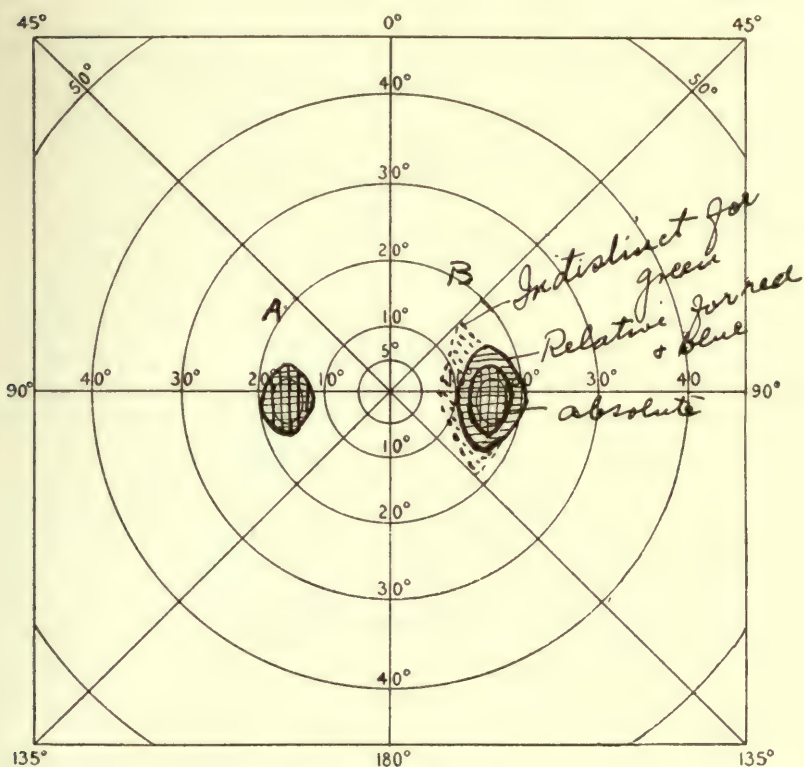


Fig. 4.

- A.—Chronic ethmoid disease.
 B.—Chronic ethmoid disease. Studies made several days after operation. Orbital wall necrotic.

Coloboma of the disc may include only the disc or it may be so extensive as to include the macula. Figure 1 is the blind spot of an extensive central coloboma, including the macula and disc. In these areas the enlargements as a rule are absolute, both for form and color. Surrounding the absolute zone, there may be a narrow ring of indistinct scotoma. It has also been definitely pointed out that even in the absolutely blind area a test object larger than the small disc usually employed for a study of the central field may excite some visual sensation for form,—an area of indistinct scotoma for white within the blind area. This argues for the preservation of a few of the rod and cone elements in the colobomatous area.

Opaque nerve fibers rarely produce enlargements of the blind spot for form. The enlargement as a rule is relative for colors, and more frequently shows a qualitative color loss. (See Fig. 2.)

Myopia.—Studies of the blind spot in myopia are interesting. In low grades of myopia, the distance of the blind area from the fixation center is increased. When, however, the anterior-posterior diameter of the ball is lengthened by a progressive myopia, the blind spot is much enlarged by the pulling away and atrophy of the tunics of the eye. This is well illustrated in Figure 3. The patient was a high myope of minus 23 diopters, and the blind spot was charted after a successful cataract extraction with corrected vision of 20/50. Ophthalmoscopically, the case was one of posterior staphyloma, the retina being thinned out and pulled from the disc for a considerable distance. The chart shows an absolute enlargement with a large relative zone for red and a much enlarged area toward the macula where green was totally absent. The optic nerve had undergone considerable change, as shown by the contracted form and color fields. This field represents an advanced stage of myopia. The pulling away and thinning out of the retina can be clearly defined on the campimeter as myopia progresses. As this is a pathologic process, the indistinct peripheral zone is usually in evidence.

Accessory Sinus Disease.—Enlargement of the blind spot is probably of more value as a diagnostic symptom in accessory sinus disease than in any other conditions in which it occurs. Much of the uncertainty which has existed in the minds of those observers who have doubted the value of this symptom has been due to the difficulty in defining the blind spot on an arc perimeter. The campimeter or tangent perimeter is the instrument which

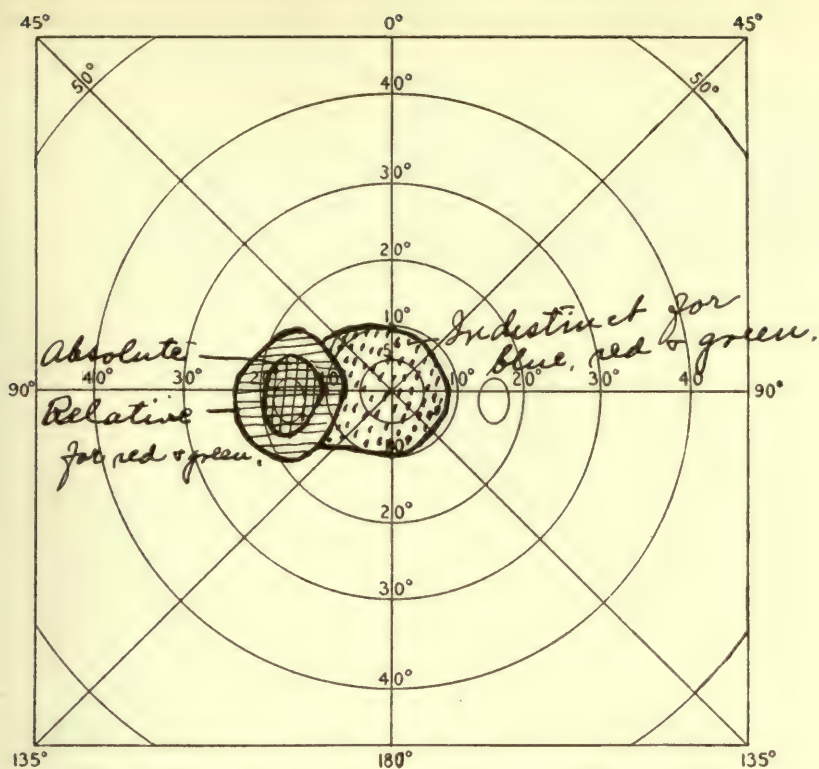


Fig. 5.—Chronic interstitial nephritis. (Albuminuric retinitis.)

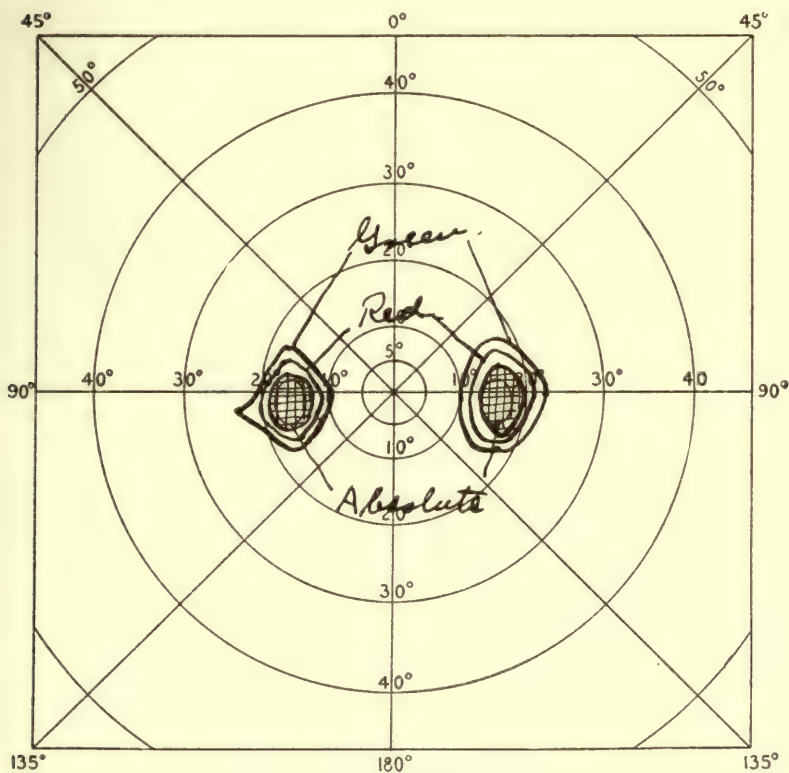


Fig. 6.—Chronic interstitial nephritis.

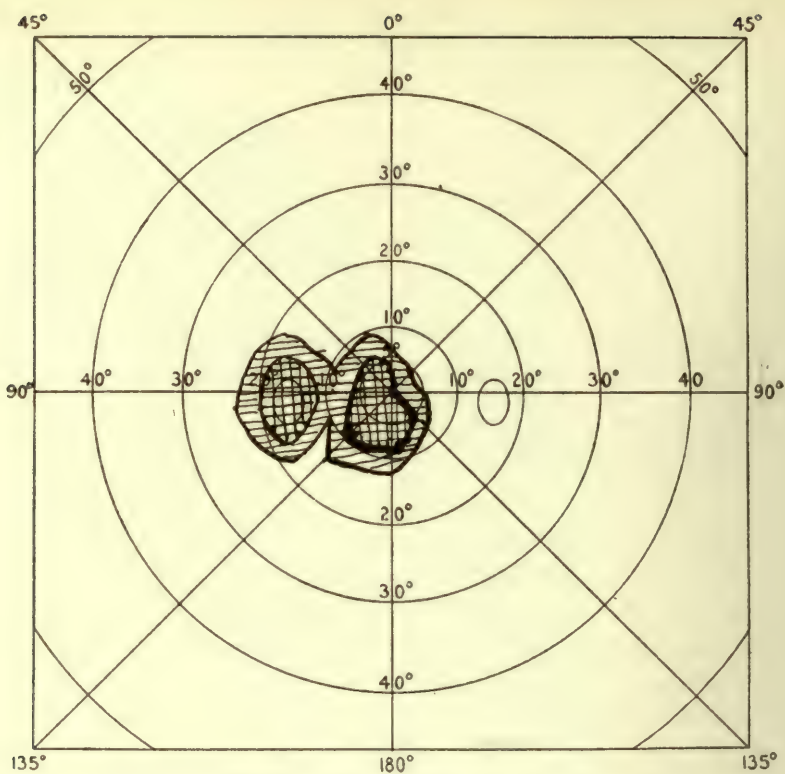


Fig. 7.—Acute retro-bulbar neuritis.

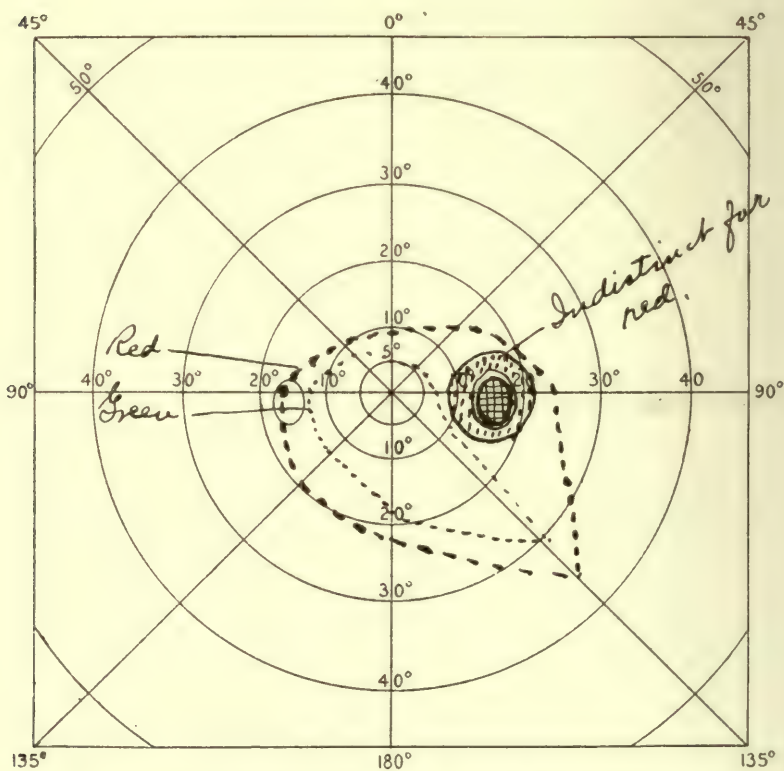
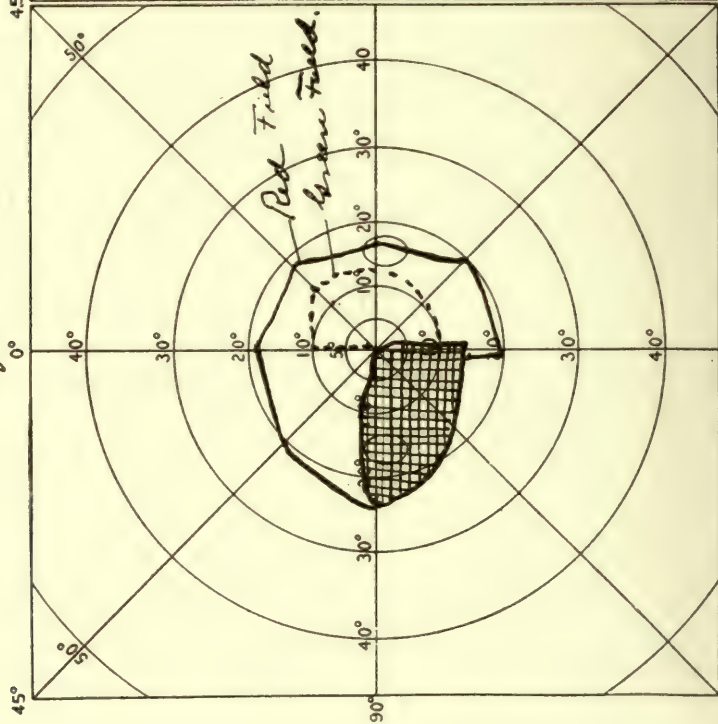


Fig. 8.—Primary optic atrophy in a case of tabes dorsalis.

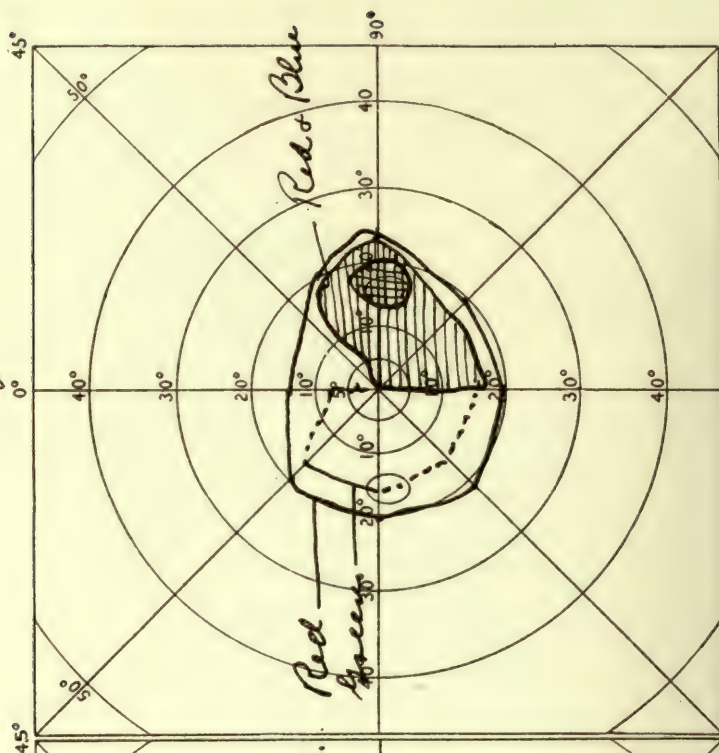
lends itself best to a careful study of the central part of the field. The fact, too, that it is not always enlarged in all forms and stages of sinus disease is an additional factor which has contributed to the confusion on the subject. Enlargements have been reported in disease of the sphenoid, ethmoid, antrum, and in a few instances in advanced frontal sinusitis. Posey reported an instance of the latter. In this case, the author reports that the rhinologist found other sinuses involved in the inflammation. The essential factor in enlargements of the blind spot in sinusitis is disease of the bones which make up particularly the posterior part of the orbital cavity, infection carried along the blood stream or secondary vascular disturbance. In the sphenoid and posterior ethmoid cells, disease even of a mild type may therefore involve the optic nerve. In the small optic foramen the outer covering of the nerve is continuous with the periosteum of the bone, and both posterior ethmoid and sphenoid cells are in close juxtaposition. Even a simple congestion, therefore, may give rise to pressure on the nerve without extensive bone involvement. The anterior ethmoid and the antrum must, on the other hand, be profoundly affected before the orbital cavity becomes invaded, and nothing short of extensive necrosis of the frontal cells will give rise to optic-nerve symptoms, unless infection is carried by the blood stream.

Acute inflammations of the sphenoid and posterior ethmoid are apt to produce optic-nerve symptoms quite early in the history of the case. Van der Hoeve has called our attention to the fact that the peripapillary nerve fiber bundle may be involved long before other parts of the nerve show signs of disease. This is particularly well shown, as he claims, in the early enlargement of the blind spot. Occlusion of the ostia of the antrum may, in a similar manner produce distention in acute inflammation and encroach upon the optic nerve. It is doubtful, however, whether acute frontal sinusitis can ever produce optic-nerve involvement. In acute sphenoidal disease, the optic nerve is involved so early that disturbances of vision may be one of the first symptoms of which the patient will complain. In fact, vision may be so much reduced that perimetric studies will only show light perception and light projection, and a study of the blind spot cannot be made. If, however, the examination is made sufficiently early an enlarged blind spot will be found, as in any other form of retrobulbar neuritis, even though ophthalmoscopic changes cannot be observed.

L. Eye.



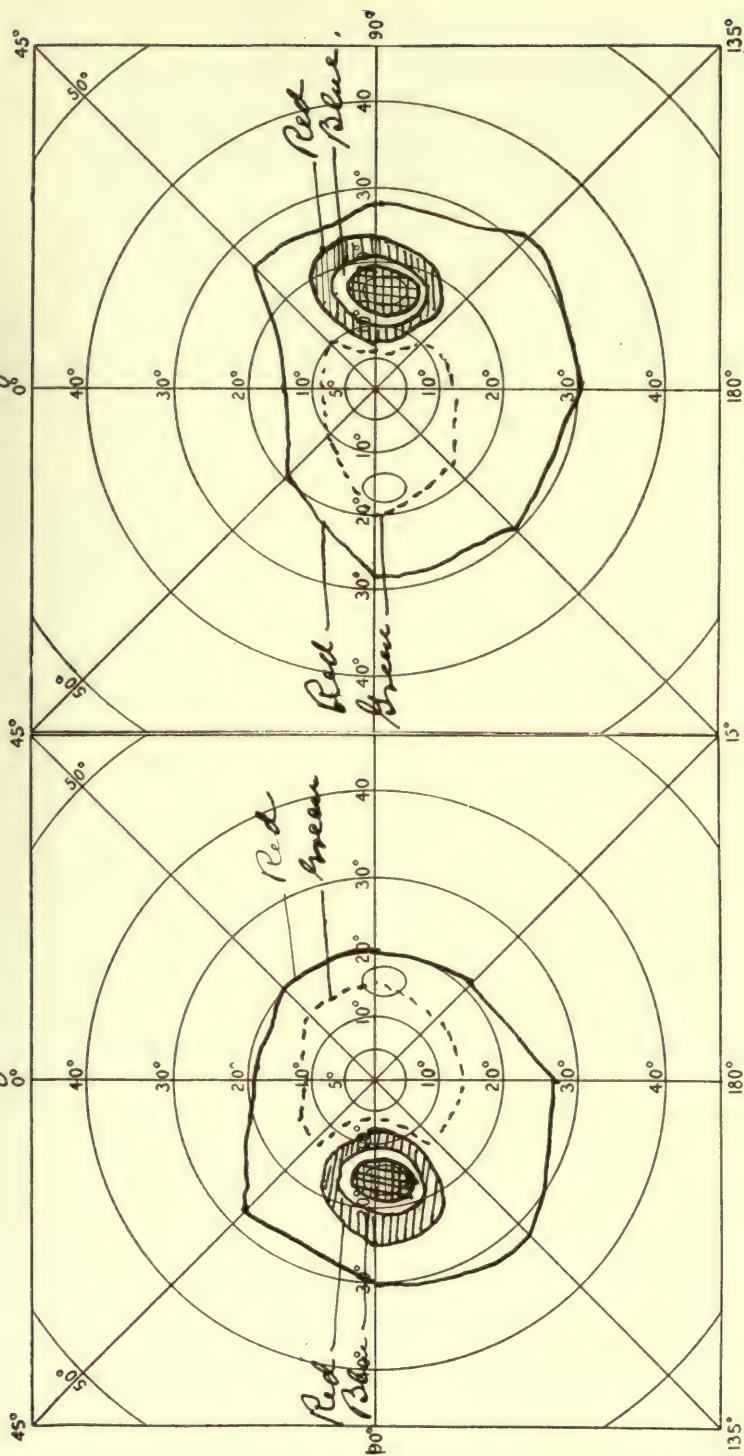
R. Eye



Top Part of Figure 9.

L. Eye.

R. Eye.



Bottom Part of Figure 9.

Optic neuritis due to a gamma of the chiasm. Upper fields soon after onset. Lower fields one week after anti-syphilitic treatment was begun.

It is, however, in the chronic forms of sinus disease that the symptom is of most diagnostic value. Here the process is slow and insidious, and the diagnosis is not always readily determined. Furthermore, danger of complete optic atrophy may be averted by early operation if the diagnosis is properly made and if there is evidence of this first symptom of optic-nerve involvement. Chronic disease of any one of the four accessory cavities may be the cause of a retrobulbar neuritis. The order in which this is most frequently observed is sphenoid, posterior ethmoid, antrum, anterior ethmoid and frontal sinusitis. In the latter location, however, nothing short of extensive necrosis is apt to be accompanied by optic-nerve disease. In disease of the sphenoid and posterior ethmoid, on the other hand, the nerve rarely escapes because of the proximity of these air spaces to the nerve.

A central scotoma may or may not accompany the enlarged blind spot as in other forms of retrobulbar neuritis. With this, and other perimetric findings, however, this paper is not directly concerned.

In view of the frequency of this symptom therefore in both acute and chronic sinusitis, it should be needless to urge that careful perimetric studies be made in all suspected or recognized forms of sinusitis, even though ophthalmoscopic findings are negative.

Chronic Interstitial Nephritis.—A clinical picture sufficiently characteristic to be suggestive of arterial hypertension is now recognized. The essential features are venous stasis, retinal edema, and finally a low grade neuroretinitis. Fields become contracted for form and color, and in a majority of instances there is a characteristic enlargement of the normal blind spot. This enlargement is present in fairly early stages of the process and long before the so-called typical albuminuric retinitis manifests itself. The same condition, although to a lesser degree, obtains in high blood pressure of chronic diabetes. It is evidence of the neuroretinitis and edema around the disc which accompany these conditions. In Figure 5 one eye shows an enlargement due solely to optic-nerve involvement. (Enlargement not recorded on the chart.) The other blind spot is extensively enlarged by massive areas of degeneration of the choroid and retina—the so-called “albuminuric retinitis.” Absolute enlargements are not infrequent, even in what have heretofore been regarded as mild forms of retinal disturbance from this source, but color enlargements, particularly of the qualitative type, are more frequently recognized. From my studies thus far made in this direction,

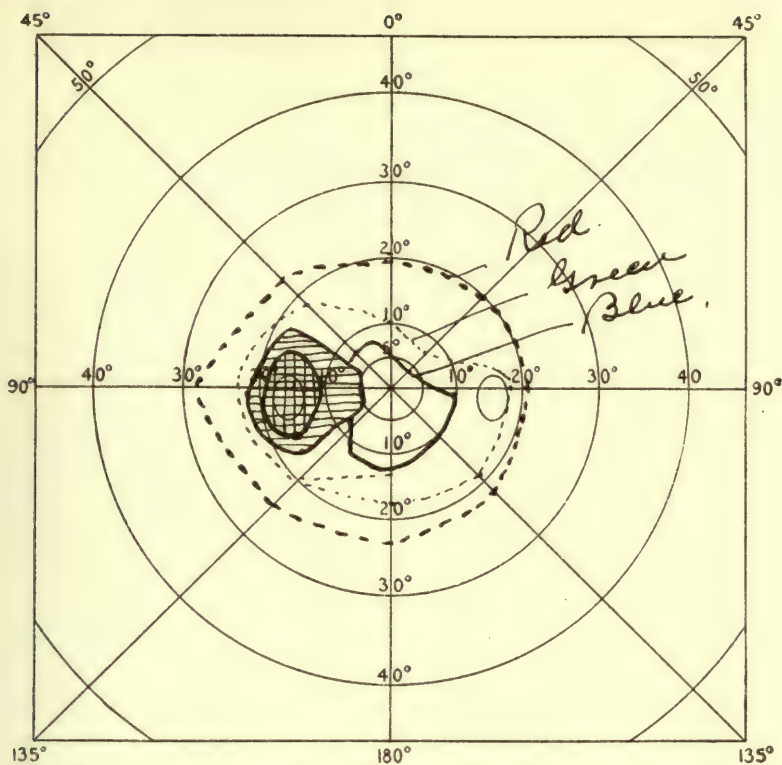


Fig. 10.—Chorioretinitis especially marked in the peripupillary region.

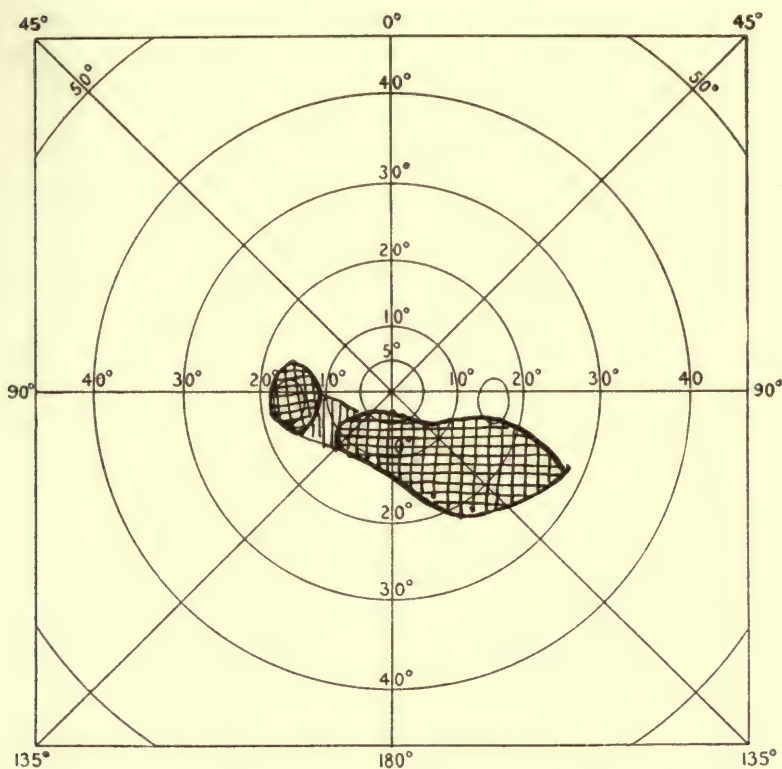


Fig. 11.—Central chorioretinitis.

the possibility of recognizing, or at least suspecting, incipient forms of chronic interstitial nephritis from perimetric studies seems as hopeful as the recognition of the pre-albuminuric retinitis stage by the use of the ophthalmoscope.

Optic Neuritis and Papilledema.—Probably all forms of optic neuritis are accompanied by enlargements of Mariotte's blind spot. Frank types of optic neuritis visible with the ophthalmoscope need hardly detain us. As a rule, the blind spot suffers more than the peripheral field, particularly when the disc is swollen, as in papilledema. This, as a matter of course, is in the early stage, before regressive changes have taken place, and before atrophy is established. A qualitative color loss usually covers an area in proportion to the degree of swelling, while absolute enlargements occur at a later period when atrophy has begun.

Like the central scotoma, enlargements of the blind spot are of more diagnostic value in forms of true retrobulbar neuritis without observable ophthalmoscopic signs—the toxic amblyopias, especially of the chronic variety. Although a central scotoma as a rule is the recognized diagnostic symptom, a careful study on the campimeter will often show an enlargement of the normal blind spot, extending particularly toward the macula, with a bridge of qualitative color loss connecting the central scotoma and the enlarged blind spot. Later in the case, these scotomata may unite into one central scotoma. Bjerrum's syndrome, or scotoma in chronic glaucoma, is similar in character, although different etiologically. In the more acute forms, or rather those which come on rapidly, this is especially apt to be found. If the process is not arrested, the two relatively blind areas become absolute and finally coalesce into one central scotoma. If, however, the blind spot remains normal for white, it should not be regarded as conclusive evidence of the absence of disease. The early change is a qualitative color loss followed by a relative loss for one or more colors, and finally an enlargement for white. These examinations require care and precision, but above all, the patient must be instructed as the examination proceeds.

Choroid and Retina.—Enlargements of the blind spot are noted in choroidal and retinal disease limited to those tunics of the eye, or in chorioretinal disease which eventually brings about optic atrophy. In peripapillary chorioretinitis the blind spot may be enlarged in direct proportion to the choroidal and retinal involvement. As a rule, these enlargements are of the indistinct or relative variety,—an absolute enlargement being noted only in

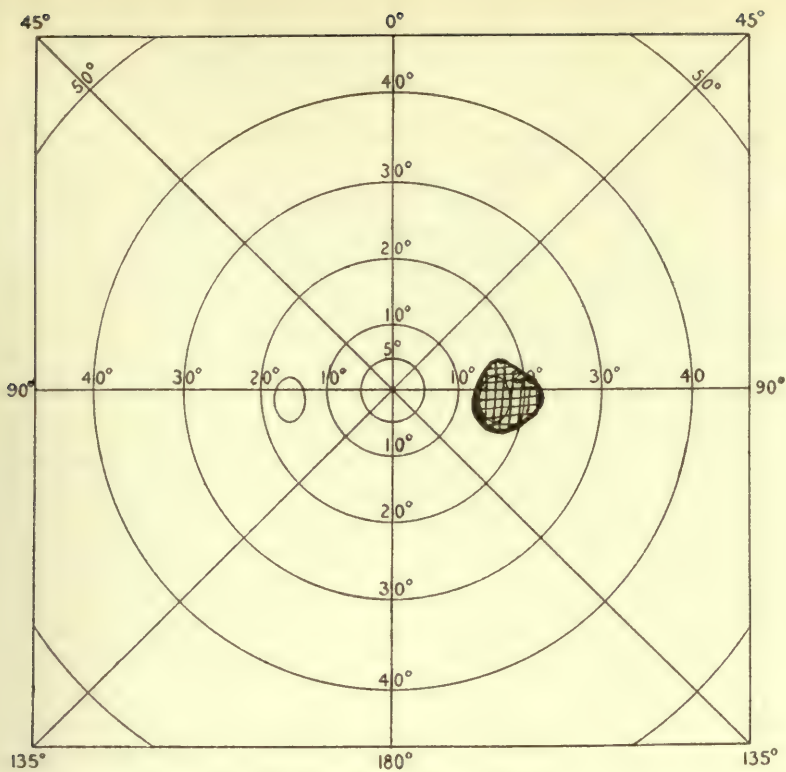


Fig. 12.—Commotio retinae. Recent.

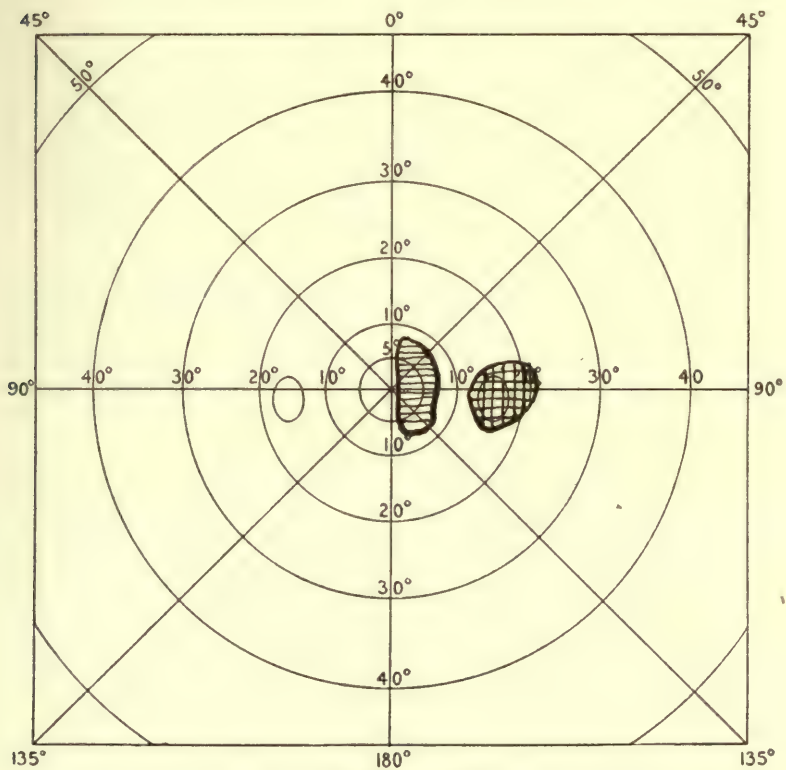


Fig. 13.—Commotio retinae. Old.

well established disease such as sometimes occurs in chronic Bright's disease (massive areas of atrophy, hemorrhage, and retinal detachment). There is, however, an interesting difference in color behavior between disease in which the choroidal changes predominate and those in which the retina shows the greatest involvement. In disease of pure nerve elements, as in optic neuritis, and in retinitis, the blind area enlarges progressively for form to blue, then red, and finally green. It is interesting to note, however, that when the choroidal involvement predominates, blue may suffer more, or at least quite as much as the red and green. This is in keeping with the changes which are observed in the peripheral field in chorioretinal disease. It is of diagnostic value.

Commotio Retinae.—Finally, and of no less interest, are the changes which take place in commotio retinae after injuries to the globe. Lohmann very ingeniously and correctly, in explaining the formation of ring scotoma occasionally observed in commotio retinae, has pointed out the fact that the firm attachments of the choroid and retina are at the entrance of the optic nerve and the ora serrata. Between these points the tunics are very loosely connected by areolar tissue. In injuries to the globe, therefore, the line of fracture usually extends from the optic disc. It is not unusual to find the blind spot increased in size, particularly in the direction of the rupture of the choroid and retina, or symmetrically around the disc, when no visible evidence of a break can be made out.

Figure 12 is an enlargement of this sort, due to a slight break and a hemorrhage on the edge of the disc following a blow on the eyeball. Figure 13 is a similar case due to injuries of a similar character.

What I have said of care and precision in the examination of cases of toxic amblyopia applies with equal force to all examinations of the blind spot and the central field. "Earth has her price for what Earth gives" in perimetry. Patience and accuracy are correlated.

DISCUSSION

DR. WENDELL REBER, Philadelphia:—I take great pleasure in acknowledging the value of this paper and this instrument. A few words about the campimeter would not be amiss. The instrument of value is the one that can be quickly used to give us fairly accurate results. This one was especially designed for the quick and ready recognition of the blind spot, and I should not want to practice without it. I want to direct your attention to the statement of Ole Bull that the best way to take the visual field is to map out the blind spot first, and if the patient will understandingly allow you to do that, you can get a fairly trustworthy visual field

whatever you are aiming to do. One fact particularly stands out; that enlargements on the temporal side are more likely to occur than those on the nasal side, while on the other hand enlargement on the nasal side is twice as significant as on the temporal side. It means that the object is further away from the center, with a resultant diminished color sense, and that will make the findings a little doubtful; we must also reckon the fact that there are many more nerve fibers passing over the nasal side, and if involved in the least they will affect the size of Mariotte's spot. I have here a chart with typical enlargement in a young colored woman with an acute sinusitis, in which the condition is easily illustrated. There was slight congestion of the nerves, with a little blurring of the nasal edge of the disc. Here is one of a young man of 21 who had meningitis, with much enlarged blind spots as indicated. As to central scotoma, if one cannot get normal vision and there is no fundus disease as determined by the ophthalmoscope, immediately search the field of vision with the 2 mm. colored object and determine whether there is any reduction in the central color sensibility. To me the great value of this campimeter is to recognize changes which are so fine as to escape the ophthalmoscope, but which are readily determined with this instrument. The arc perimeter is not to be mentioned in the same breath as this instrument we have here, in the rapid determination of the size of Mariotte's spot and the ready detection of central scotomata relative or absolute.

DR. JOHN R. NEWCOMB, Indianapolis:—I wish to compliment the author on the presentation of this paper, very much indeed. The paper itself is but the expression of months and years, perhaps, of true research work. In my work I have found that the absence of just such a method is a decided handicap. I feel that the average ophthalmologist will use the perimeter when forced to do so. A number of cases get by where if we took a careful perimetric field we would get results. With an instrument of this kind the doctor has a simple and quick method of determining this question immediately. It has been my experience that in addition to the changes mentioned by the doctor, further investigation will lead us to believe that other conditions exist. In one case where there was nothing in particular to go by, when I happened to use the perimeter the enlarged blind spot was discovered and the case proved to be one of intestinal autointoxication which was the cause of the optic-nerve difficulty.

DR. PETER (closing discussion):—I will not take up more time of the Academy than to say that in order to bring my paper within reading limits much was necessarily omitted. I have, however, placed on the blackboard, back of the chairman, a diagram showing the relative size of the normal blind spot at one-third of a meter, 1 and 2 meter distances from the campimeter. Our ideas are rather hazy as to just how large the blind spot should be at these various distances.

THE REFRACTION OF MYOPES

A CONSIDERATION OF CURRENT AMERICAN TEACHINGS

EMORY HILL, M.D.

CHICAGO

In the hope of clearing up to some extent the confusion which beginners in refraction work experience from the variety of opinions they hear in regard to myopia, I sent a list of questions to 130 teachers of ophthalmology in American schools, from whose answers certain interesting tabulations may be made. The questions were necessarily of a general sort to which categorical answers cannot be given. Some questions could be answered completely only after prolonged search through case records covering a period of years; which, I am glad to say, no one felt called upon to make, for such a task would be a burden which I had no desire to inflict. Seventy-eight replies were received, varying from brief statements of general rules followed in the refraction of myopia and myopic astigmatism to elaborate answers in the form of letters which are of such value as to warrant extensive quotation.

I take this opportunity to express my thanks to the large number of colleagues who generously replied. In fairness to them it should be emphasized that we recognize the impossibility of stating iron-clad rules to which every patient can be made to conform, and we simply attempt to state some general principles underlying the problem of refraction in the difficult class of cases under consideration. That there is at least a majority opinion in favor of certain thorough methods of treating these cases, based upon a fairly definite understanding of the significance of myopia and myopic astigmatism, will be shown in the tabulations which follow:

Question 1. Do you make use of cycloplegia in refracting myopes?

Sixty-four replied "yes," without qualifying their answer.

Eight use cycloplegia usually, making some exceptions.

Three do not ordinarily use cycloplegia.

Three replied "no," without qualifying their answer.

Question 2. What is your method of using cycloplegia in myopia and myopic astigmatism in children?

Question 3. What is your method in adults less than 30 years of age?

Question 4. What is your method in adults between 30 and 40 years.

Question 5. What is your method in adults between 40 and 50 years?

Question 6. What is your method in adults more than 50 years of age?

The answers to these five questions can be tabulated under the caption:

THE USE OF CYCLOPLEGIA

	Children	Between 20 and 30 yrs.	From 30 to 40 yrs.	From 40 to 50 yrs.	Over 50 yrs.
Atropin habitually	36	11	3	..	..
Atropin usually (in preference to homatropin)..	8	..	2	1	1
Homatropin usually (in preference to atropin)..	7	12	11	11	..
Homatropin habitually	9	29	33	17	12
Atropin or homatropin (no preference stated)..	3	8	4	5	3
Atropin or scopolamin.....	2	..	..	..	..
Atropin, homatropin or scopolamin.....	..	1	..	..	..
Atropin or duboisin.....	2	..	..	..	..
Duboisin	..	1	1	..	..
Homatropin or scopolamin.....	..	1	1	..	..
Homatropin or hyoscin.....	1	3	3	2	1
Scopolamin	4	4	2	..	..
Drug not indicated.....	1	..	..	..	..
Usually no cycloplegic.....	2	2	11	19	22
Never use cycloplegic.....	3	6	7	20	39
Weak cycloplegic up to 45 years, but no cycloplegic after 45 years.....	..	..	..	3	..

In this table the term "habitually" is used instead of "always" in order to include the answers of those men who recognize the impossibility of using the method in some exceptional cases which they would like to use always. The term "usually" is employed to indicate that a certain drug is preferred, but many exceptions are admitted. The drugs which have been named are generally employed in the form of the following salts and dosage: Atropin sulphate, 0.5 to 1 per cent; homatropin hydrobromate, 2 to 5 per cent (generally the weaker); scopolamin hydrobromate, 0.10 to 0.05 per cent; hyoscine hydrobromate, 0.10 per cent; duboisin sulphate, 0.5 per cent. A few men employ gelatin discs and atropin in the form of the alkaloid in oil. With the exception of homatropin, these drugs are generally used over a period of one to several days, 1 drop or 2 drops, in each eye three times daily. Homatropin is sometimes used the night before the examination and again several times within the hour preceding the examination; but more often it is limited to office use, from

three to six applications at intervals of from five to ten minutes, the refraction being made after a period of one hour or one hour and fifteen minutes from the first instillation. There are some replies indicating a preference for an amount of cycloplegia between the prolonged effect of atropia and the brief action of homatropin, as three instillations of one of the other drugs mentioned in one day.

The important deduction warranted from this table is that American ophthalmologists believe in cycloplegia. Thus 73 of 78 men use some cycloplegia in myopic children; 52 of these use a stronger drug than homatropin, while 44 prefer to use atropin, the strongest of cycloplegics. In the case of adults less than 30 years of age, 70 of the 78 men use some cycloplegic, 16 use a stronger drug than homatropin, while 11 prefer atropin. In the group of adults between 30 and 40 years of age, some cycloplegic is insisted upon by 60 of the 78 men; something stronger than homatropin is used by 6, while atropin is preferred by 5. In adults between 40 and 50 years of age, 39 (one-half of the entire number) use some cycloplegic, homatropin being the favorite drug in this and the preceding group. Even in patients beyond the age of 50, 17 men use a cycloplegic; this does not include the use of cocain and euphthalmin for mydriasis.

Question 7. Do you prescribe the full astigmatic correction for myopes? If not, what exceptions do you make?

Fifty habitually give the full astigmatic correction.

Twenty-three do the same except in the cases of very high astigmatism where they give a partial correction.

Two usually cut the astigmatic correction slightly (0.25 or 0.50 D.).

Three habitually give only a partial correction for astigmatism.

Thus seventy-three of seventy-eight replies indicate the desirability of correcting as fully as possible the existing astigmatism; a minority granting the desire of the patient to have the glass which gives more immediate comfort when the astigmatic error is high. This applies generally to individuals who have not worn glasses in youth.

Question 8. How much of the myopic correction do you prescribe in cases of 3 D. or less?

Question 9. How much in cases of 3 D. to 6 D.?

Question 10. How much in cases of 6 D. to 10 D.?

Question 11. How much in cases of 10 D. to 15 D.?

Question 12. How much in cases of more than 15 D.?

The answers to these five questions can be grouped under the heading:

CORRECTION OF MYOPIA ACCORDING TO THE AMOUNT OF ERROR

	Less than 3 D.	Between 3 and 6 D.	Between 6 and 10 D.	Between 10 and 15 D.	More than 15 D.
Full correction	62	48	37	15	14
Nearly full (less .25 or .50 D.)....	9	12	6	12	14
All that age and accommodation will allow with comfort.....	5	16	27	40	41
Partial correction (1 D. to 3 or 4 D. less than full).....	..	..	6	8	6
Full or slightly over.....	1	1	1	..	..
Overcorrection	..	..	..	1	1
According to fundus.....	..	..	..	1	..
No rule	1	1	1	1	2

This table seems to me very instructive. The majority of seventy-eight ophthalmologists are in the habit of giving the full myopic correction except in the rare cases of very high errors. A considerable number make only a trifling reduction from the full correction, and two men habitually overcorrect myopes. To this showing in favor of a practically full correction must be added the observation that the heading "All that age and accommodation will allow with comfort" generally means (as a reading of the full replies would show) as close an approximation to the full correction as is possible in each case. The men who have answered in this way have often supplemented their answers by emphasizing the ideal of full correction which they cannot attain in cases which have been neglected in youth. Scarcely 10 per cent. of all the replies indicate a disregard of the principle of full corrections.

Question 13. Do you advise every myope to wear glasses for distance? If not, what exceptions do you make?

Question 14. Do you advise every myope to wear glasses for near? If not, what exceptions do you make?

The answers to these five questions can be grouped under the heading:

	Distance Glasses	Near Glasses
Always advise	41	32
Usually advise	24	20
Frequently do not advise.....	13	26

Thus more than 50 per cent. of the seventy-eight men consider that all myopes should wear glasses for distance, while nearly 50 per cent. think that all myopes should wear glasses for near. The diversity of opinion on these questions is less than the table would indicate, if one considers the exceptions made to the gen-

eral rule of prescribing lenses for these cases. For example, patients with very small errors—(-0.25 or -0.50); patients with no astigmatic error; patients who will report every few months for observation; patients who object strongly to wearing glasses on the street; patients whose myopia is precisely balanced by their presbyopia, etc. After allowing these exceptions there remains the great body of myopic individuals for whom the ophthalmologists quoted would prescribe glasses for constant use, if my interpretation of their replies is correct.

Question 15. About what proportion of your cases wear one correction for all purposes?

Question 16. Can you classify your cases in this respect according to age and according to the amount of myopia?

The answers to the first of these two questions frequently covered the second as well.

PROPORTION OF CASES WEARING ONE CORRECTION FOR ALL PURPOSES

Nearly all young patients.....	43	75 per cent.	3
The majority of all patients.....	6	60 per cent.	1
Large proportion of the young, few of those over 30..	3	50 per cent.	1
Ninety-five per cent.....	1	40 per cent.	1
Ninety per cent.....	3	Very few	1
Eighty per cent.....	2	No answer	13

Fifty-seven men did not answer separately Question 16 since their reply to the previous question indicated that ability to wear one pair of glasses for all purposes is largely a matter of youth. Some emphasized the factor of small errors and previous adequate correction. It seems to be agreed that individuals with high errors and those who have had no glasses or very partial corrections in youth have difficulty in maintaining accommodation for near vision with an adequate far seeing glass. Twenty-one replies to Question 16 specified that the young and the cases of low error wear one pair of glasses for all purposes.

Question 17. Can you make any observations from your personal experience in regard to the success of your method of treatment in preventing the increase of myopia?

The majority of replies to this question indicate satisfaction on the part of the ophthalmologist with his method, while a few express no enthusiasm for any method and feel that the problem of myopia has not been solved and even that its solution is divorced from the realm of refraction. Forty-one men believe that the use of cycloplegia extensively and the constant use of the full myopic and astigmatic correction are the surest preventives of increase in myopia. Four men express faith in the

opposite method of scant use of cycloplegia and wearing only a partial correction. Two men do not use cycloplegia, but prescribe full corrections. One man emphasizes the value of giving a restful near glass, and always prescribes bifocals. This he believes to be the secret of success. Five men emphasize the importance of a full correction of astigmatism and of hyperphoria, together with attention to hygiene. One man says that myopes must give up all near work. Two men feel that when myopia develops in youth it will increase in spite of all treatment. Two men state that they do not see progressive myopia. One man has seen only one case of "malignant" myopia in 15 years. Three men think that glasses have no influence upon myopia. Three men regard heredity as the principal factor. Thirteen attempt no answer to this question.

It is unsafe to draw hard-and-fast conclusions from a small number of observations, especially when the personal bias of the one reviewing the data enters into the judgment. Allowing for these factors, I believe that the following statements may fairly be made as a résumé of the teachings of the seventy-eight ophthalmologists whose views have been tabulated:

American teachers of ophthalmology believe in the thorough use of cycloplegia in the refraction of myopes (more than 90 per cent.).

They believe in the full correction of the astigmatism existing in myopic cases (more than 90 per cent). The exceptions to this rule are in the very high errors which have not been corrected in youth.

A large majority regard the full correction of myopia as the ideal to be sought, while many think this ideal unattainable in cases which have gone through childhood and early adult life with no glasses or inadequate glasses.

A majority think that myopes should wear glasses constantly. A majority expect patients under the presbyopic age to wear one correction for all purposes. A majority regard the wearing of the full myopic and astigmatic correction, based upon the findings under complete cycloplegia, to be the surest means of preventing the progressive increase of myopia.

Among the men whose opinions are highly valued in this Academy, some have written their views at length. I shall quote from them as representatives of the current American teachings. The following remarks are selected from the replies of Drs. Alexander Duane, John Green Jr., Edward Jackson, Samuel D. Risley, Samuel Theobald, Casey Wood and Hiram Woods.

"I consider it exceedingly important that the ciliary muscle be completely under the influence of the cycloplegic and the choroidal congestion be allowed to subside before refraction is attempted. Numerous cases come into my hands in which myopia has been overcorrected by opticians, and, I regret to say, by oculists who use cycloplegia carelessly or not at all."

The correction "depends on visual acuity, condition of fundus, age, and finally determining how much the patient will take comfortably. I come as near total correction as possible, if the fundus is good and if accommodation develops. If it does not, I reduce the correction to the point of comfortable tolerance."

"I have regarded myopia as pathological . . . it must be treated from that point of view; in correcting the refraction error a cycloplegic is just as necessary in myopia as in hypermetropia; that since the myopic eye is a pathologic eye the cycloplegics are even more necessary because of their remedial influence over the pathologic condition of the uveal tract. I have never hesitated to use the atropia or hyosciamin sulphate three or more times daily for long periods of time at any age or any degree of myopia or myopic astigmatism in more or less malignant choroidal conditions, but have often employed at the same time weak solutions of eserine salicylate (grain 1/20 to 1/40 to fluid ounce 1) twice daily, not to counteract the mydriasis of the cycloplegic, but because of the physiologic influence in contracting the dilated anterior ciliary vessels. . . . I prescribe full corrections up to 15 D. and always a full correction of the existing astigmatism. Many myopes have high degrees of hyperphoria. This I have always been careful to correct either with vertical prisms or by cautious tenotomies. . . . After 50 years of age I prefer homatropin solutions three or four times daily and the eserine solution at bedtime and in the morning."

"In practically all my refraction cases, from 8 to 45, and in nearly all examined for the first time between 45 and 49, I use homatropin. I make no distinction in this regard between myopia and hypermetropia. In cases over 40, and in others, too, if I think there is any possibility of glaucoma, I test the tension before recommending homatropin. . . . In cases in which the range of accommodation remains high (above 1 D.) in spite of repeated instillations of homatropin, or in which the results are unusually varying, or in which skiascopy shows a varying, evidently unrelaxed, accommodation I proceed to the use of atropin just as for children under 8. And I find it necessary to do this fully as often in the case of persons over 40 as in younger people. It has

been my experience that it is just in these older subjects that it is hard to get the accommodation to relax. . . . My cardinal principle in applying the correction in myopia is thus stated: Whenever possible the patient should wear (a) the full correction of his myopia and (b) wear the same correction for distance and near. . . . My experience has been that in myopia of under 10 D. I can in almost every case, and in myopia of 10-15 D. I can in a vast majority of cases prescribe the full correction with satisfaction, comfort and advantage to the patient. This is occasionally possible in patients over 15 D. . . . Of course, the younger the patient the easier it is to apply the full correction. But in older subjects seen for the first time I should always feel inclined to order the full correction experimentally, believing that in the great majority of cases the experiment would succeed and that, if successful, it would afford the patient more relief than would an undercorrection."

"Moderation in the near use of the eyes, proper lighting and avoidance of the stooping position are important; but far more important is the correction of accompanying astigmatism, anisometropia, and heterophoria, both in far and near, but especially in near vision."

"I am sure that, since I have treated young myopes with total correction, provided they have good fundi and normal vision, I have seen fewer cases of progressive myopia. . . . I do not see how one can come anywhere near accuracy without cycloplegics."

"Under the continuous wearing of the full correction increase of myopia is rare at any age and under any circumstances. When it occurs it ceases after repeated correction."

A different emphasis on treatment is indicated in the next quotation: "In treating myopia of the (possible) progressive variety the use of glasses is but one—and a relatively small—factor. To be rigidly insisted upon in addition are the usual rules of ocular hygiene. In the hereditary type, especially care in the amount and time of reading and other near work, outdoor life, illumination, the state of the health, use of atropia, tinted lenses, oculomotor exercise, sort of type of books, etc., are quite as important. In about one-third of these cases in particular, I am unable (for various reasons that might well fill a volume) to prevent the slow but certain progress of the myopia. I console myself with thinking, however, that if nothing had been done the 4 or 5 D. myope might have gone on to 10 D. or more."

In conclusion, I would emphasize that a majority of seventy-eight American teachers of ophthalmology believe in a painstaking and time-consuming scientific method of refracting myopes, and moreover, that this method is advocated with enthusiasm by a considerable group of those whose positions as leaders in our specialty entitle their views to the utmost respect. My brief investigation reveals no extensive opposition to these views; yet here and there conflicting teachings are producing confusion in the minds of students and bringing discredit upon the profession who should exhibit some uniformity in a practice which is supposed to be based upon an exact science. I venture to hope that such an organization as this Academy may help to standardize teachings on such important subjects.

NOTE.—The 130 men whose opinions were sought include the teachers of ophthalmology as found in the catalogues of the medical schools which constitute Class A of the last classification of the Council on Medical Education of the American Medical Association, and teachers in the various postgraduate institutions of the United States.

DISCUSSION

DR. EDWARD JACKSON, Denver:—The small minority who fear full correction of myopes take their ground largely on account of old teachings with regard to it, and especially the teachings of Germany, where the use of the full correction is comparatively recent. Twenty years ago I reported a series of cases of high myopia before the American Ophthalmological Society, and was surprised to find then, in opposition to what was to be read in the textbooks, that a large percentage of the members were giving full corrections in myopia. Someone then raised the question about the myopic oculists, were they wearing it or not; and with one exception they were all wearing full correction.

With reference to the cycloplegics: in my view they are just as important in myopes as in hyperopes, when it is important to get the exact correction. Myopia is likely to be associated with a little spasm of accommodation. The inconvenience of using a cycloplegic in a myope is less than in a hyperope, so there is no reason why we should not use them as freely here as we do in any class of cases.

DR. WALTER B. LANCASTER, Boston:—It has seemed to me that in myopia a cycloplegic is likely to be needed more than in hypermetropia. I am speaking of the average cases of moderate or small degree. Spasm of the accommodation seems to be even more harmful in myopia than in hypermyopia. Similarly astigmatism seems to be of greatest importance in myopia. I have seen a small myopia which was progressing from year to year become arrested immediately after the astigmatism was properly corrected. Risley has given memorable expression to this important truth when he said that *the eye passes to myopia through the turnstile of astigmatism*.

DR. WILLIAM B. VAN NOTE, Lima, Ohio:—What seems remarkable to me is that every physician did not use the cycloplegic in a low grade of myopia. I do not see how any man can profess to examine the low grades without a cycloplegic.

DR. CLARK W. HAWLEY, Chicago:—One case will serve as an example to illustrate the need of a cycloplegic. A friend of mine had been to some other oculist who fitted glasses without a cycloplegic. He received —3.25 cylinders axis 180, with 20/20 vision. He wore these with comfort for several months or a year, when he began to have trouble and came to my office. I put in homatropin and cocain and found by retinoscopy that his total refraction was +3.25 with +3.25 cylinders axis 90, with vision 20/20. The reason for his wearing the former correction for some time with comfort is readily explained and need not be dwelt on here. Many such cases drift into the office of the man who uses a cycloplegic.

DR. LUTHER PETER, Philadelphia:—I am in entire accord with the gentlemen who believe in cycloplegia in all cases of myopia, provided the myopia is less than 6 diopters. It is perfectly possible to do good refraction on a myopic case of more than 6 diopters without the use of a cycloplegic. It is well also to bear in mind the fact that cycloplegics may do harm in high degrees of myopia; and myopia of more than 6 diopters should be regarded as being within the danger zone of a progressive myopia.

DR. LYNN EMMERSON, Orange, N. J.:—I want to lay stress on what Dr. Lancaster says with regard to correction of astigmatism. I think it has a great bearing on the progress of myopia, and particularly if you rely on a subjective examination you should not be satisfied with normal vision. I have in mind a college woman who was wearing —3.50 sp., reading 20/20. Under cycloplegic she took —2.75 s. C —1.00 c. at 180 and read 20/10. She had been refracted by good oculists, who were satisfied because she read 20/20.

DR. H. H. MARTIN, Savannah, Ga.:—I want to ask if any one here has ever seen glaucoma, following the use of atropin in a patient under 30 years of age, with high myopia? I had a patient a year or two ago, about 26 to 27, with a very high myopia. In determining her refraction I used atropin in both eyes. Some months later she went to a colleague in New York who told her that she had glaucoma as a result of my having used atropin in her eyes, and I am informed operated on her for glaucoma. The patient did not return to me, and I, of course, had no opportunity to defend myself, but I do not believe that he was right. I shall continue to use atropin in my refraction work when I find it necessary to do so.

DR. OLIVER TYDINGS, Chicago:—I did not hear the first part of the paper, but one idea has been injected which I do not want to let go without protest. This came from Madison, Wis., where pupils with myopia are put under such a severe strain. I think any education that has the undoing of the physical being of a man is wrong. I would urge the men in the university cities to be on their guard, and to try to teach the teachers of these pupils the harm they are doing those in their charge.

I divide my myopes into two classes—one above 6 diopters, the other below. I have never seen but one case of or above 15 diopters which remained so for twenty years without evidence of deterioration of vision. That case had better than 20/20 in each eye and I believe was congenital.

I am strongly in favor of using the cycloplegic in all cases of myopia. A man with 3 diopters will read at 13 inches and he is not inconvenienced at all by the use of cycloplegic, and when you go to the higher degrees this is also true. I refracted a patient who had been refracted in the office of the head of one of the large undergraduate schools in this city. The patient had —3 in each eye and gave 20/20 vision. She had been suffering from headaches, and said she must have relief or she would

jump in the lake. Under cycloplegic she took $-1.25 \text{ C } 175 \times 90 = 20/20$. No headache since.

When a patient complains of pain in myopia it cannot be due to simple myopia; there must be more or less astigmatism.

DR. HILL (closing discussion):—I might say that a great many interesting points were brought out, and to do justice to them would require reading the entire list of replies to my questions. We may as well presuppose that every eye will show a degree of astigmatism, and therefore cycloplegia is required for the refraction. I see no reason why the myopic eye should not accommodate; it is the only thing the eye can do to alter its vision. Though the effort is a futile one, it is made, as shown in the frequent cases of spasm of accommodation in myopic eyes. Replying to Dr. Dwight, my practice is to attempt to see myopic patients at intervals of three months, and to refract myopes at intervals of one year, with the use of cycloplegia, whether they have experienced any need of a change of glasses or not.



Figure 1.

EPIBULBAR SARCOMA

REPORT OF A CASE WITH A NEW TECHNIC FOR USE AND TREATMENT
WITH ROENTGEN RAY. PATIENT TREATED IN 1910,
CURED AND REMAINS SO *

EDWARD B. HECKEL, A.M., M.D., F.A.C.S.

PITTSBURGH

Malignant epibulbar neoplasms are sufficiently rare that when one presents itself it is worthy of the most careful study. The recognition of the neoplasm is not especially difficult, and particularly so when it is possible to excise a bit for pathological examination. It is the treatment which interests us most and which concerns the unfortunate patient more than anything else.

Heretofore the classical line of treatment has been an excision of the neoplasm followed only too soon by a return of the growth, with an ultimate enucleation of the eyeball or even a complete exenteration of the orbit, and the whole soon resulting in a fatal issue to the patient himself.

It may be good surgery for the general surgeon to say that all malignant disease should be excised, but malignancy about the eyeball or its adnexa should, I believe, be treated without the knife. The first commandment of the cancer decalogue is "Do not cut across a cancer and leave a part behind. The part remaining will grow more rapidly than if you had left it alone altogether." In addition we have in the Roentgen-ray and radium emanations two agents which undoubtedly produce a selective necrosis of malignant tissue. The use of the Roentgen ray is not particularly new in these cases, but good results, I believe, are. The writer has used it, or had it used according to the old technic, in two cases without any flattering result, especially as to the preservation of a functioning eye.

It has been the good fortune of the writer to see, study and treat one case with a technic different than any used heretofore and with a result which is more than satisfactory.

Capt. A. H., aged 69 years, was brought to me for consultation by Dr. Charles Emmerling, Sept. 5, 1910. In April, 1910, the patient had noticed a small mass on the temporal side of his left eyeball; he consulted an oculist who excised the mass and gave a

* From the Service of the Allegheny General Hospital.

good prognosis. The growth soon returned, however, with increased activity and presented the appearance shown in Figure 1, when seen by the writer in September, 1910. The malignant nature of the neoplasm was at once suspected. A piece was excised for examination by Dr. Proescher, who, after a few days, reported it to be a spindle-celled sarcoma, Figure 2. Oct. 3, 1910, the patient was seen with the writer by Dr. S. D. Risley of Philadelphia, who after examining the patient clinically and the findings of the pathologist concurred in the diagnosis. The use of the Roentgen ray was decided upon, and the first application was

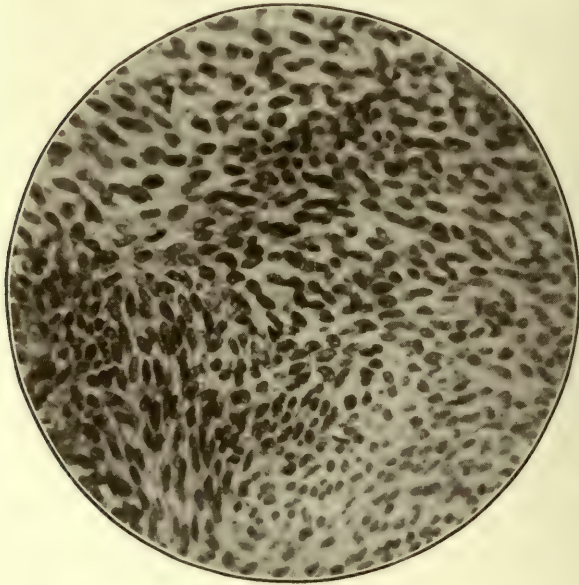


Figure 2.

made on the following day. We had considerable difficulty in exposing the eyeball by the use of a speculum. After several exposures in this way and remembering the fatal results to the exposed cornea in two previous cases the writer decided upon the technic carried out in this case and to which he ascribes the very excellent result obtained, namely, a perfectly normal eye, functioning perfectly and no return of the neoplasm at the present writing, five years after the patient was seen and the disease recognized.

The technic consisted of the use of the fingers of the writer as a means of exposing the eyeball (Figure 3) and the constant

dropping of a normal salt solution upon the cornea of the exposed eyeball during the application of the Roentgen ray. The Roentgen ray was applied by Dr. George C. Johnston under the supervision of the writer by means of a lead glass tube with a small flint glass window inserted in the wall over which was fitted a



Figure 3.

speculum of lead glass terminating in an orifice of about one-half inch in diameter.

The tube was so placed (Figure 3) that the orifice of the speculum was within a centimeter or less of the neoplasm. The tube used was one capable of maintaining a vacuum during the treatment, which permitted the passage of a current of three-

quarters to one milliampere. The length of the exposures were from three to six minutes and were applied three times per week during October, November and December of 1910 and three times per week during January, and once per week during February and March of 1911, when the eyeball presented a perfectly normal appearance and functioning normally in every way.

In May of 1911 the eyeball showed a small nodule about 1 mm. in diameter at the sclerocorneal junction at the 6 o'clock point with a few small vessels extending into the cornea; these vessels could be seen only by means of a strong loupe. The Roentgen ray was again resorted to with the above technic and applied seven times during May and eleven times in June with a complete disappearance of the nodule.

There is no doubt in the writer's mind that the constant dropping of a normal salt solution upon the exposed eyeball is responsible for the good result obtained. The healthy tissues and especially the cornea are distinctly protected by the salt solution while it does not interfere in the least with the selective necrotic action on the malignant neoplasm.

The writer wishes further to emphasize the fact that such cases can be treated successfully only by the closest cooperation of the roentgenologist and the ophthalmologist.

DISCUSSION

DR. McALLISTER, Ridgeway, Pa.: Asked whether a hard tube or a soft tube was used.

DR. E. B. HECKEL, Pittsburgh (closing discussion):—I am not an expert roentgenologist, as I have acquired the vocabulary only, but if I am not mistaken the terms hard and soft as applied to tubes were obsolete. The tube used, however, was one which formerly would have been spoken of as a hard tube. I emphasize the fact that the Roentgen ray should be handled by an expert only, and that especially in eye work the best results could be looked for only at the hands of the expert roentgenologist in connection with the ophthalmologist.

OCULAR STUDY OF A CASE OF LEONTIASIS OSSEA:

WITH A SYNOPSIS OF REPORTED CASES IN WHICH THE EYES
AND ADNEXA WERE INVOLVED

JOHN GREEN, JR., A.B., M.D., F.A.C.S.

ST. LOUIS

Abnormal thickening of the bones of the face and cranium was observed and discussed by early medical writers. The condition was designated "craniosclerosis" by Malpighi (1667) and descriptions of skulls presenting clear evidence of the disease are found in medical literature of the eighteenth and early nineteenth century. We are indebted to Virchow for the first adequate description of the anatomical changes and for the highly descriptive name "leontiasis ossea" which vividly suggests the leonine facial aspect of the victims of this disease. He recognized two principal forms; (a) leontiasis ossea diffusa, or general hyperostosis of the cranium and (b) localized hyperostosis, in which the bony enlargements appear in the form of rounded bosses of varying size, springing from the bones of the face and cranium.

General hyperostosis is an exceedingly rare condition, and mere mention of its existence will suffice for our present purpose. The localized type, to which the case to be described conforms, varies exceedingly as to the extent and site of the bony involvements. In the milder cases, the enlargements may be small and inconspicuously situated, e.g., concealed by the hair. The more usual type presents bilateral bony tumors of the face and cranium and even of the lower jaw, so that the whole facial appearance is altered and all comeliness destroyed. This alteration of the physiognomy (for the worse) is well illustrated by cases in which the disease has begun in early adult life. Comparing photographs taken prior to the onset of the disease with those taken after its full development one is able to see what gross facial disfigurement may supervene. In the most marked examples the deformity is hideous in the extreme, leading the unfortunate victims to seek surgical intervention solely in the hope of making themselves less repulsive.

The disease begins, as a rule, in childhood or early adult life. Generally speaking, it is progressive, although there may be long periods in which no appreciable change can be discerned. The

sexes are about equally represented. The course is "always a very long one and the prognosis is unfavorable" (Church and Petersen).

The symptoms are variable. Headache of varying intensity occurs in fully one half of the cases. This may be due to disease of the bone, or, in cases associated with optic neuritis, to increased intracranial pressure. Drowsiness, neuralgia, epileptic attacks, deafness, blindness and gradual mental deterioration are the signs of bony encroachment on the brain and cranial nerves.

The disease should interest ophthalmologists and otolaryngologists, for the reason that the eyes, ears and nose are frequently compromised. A gradually increasing deafness is very common. In many cases the bony masses have completely occluded the nasal passages and surgical intervention has become necessary for the purpose of reestablishing nasal respiration. The globes are not only pushed forward, but are widely separated laterally so that, in extreme cases, the visual axes diverge.

The disease is a rare one. The number of reported cases of unquestioned authenticity certainly does not exceed fifty. Lengthy papers dealing exhaustively with every aspect of the disease, with résumés of cases, have been published by Putnam, Millat, Baumgarten, Bockenheimer and others. A few papers have appeared in ophthalmic literature (Ellis, Lagleyze, Sattler, etc.), but these have been simply case reports with more or less extended comments. It has seemed worth while, therefore, to collate all cases of leontiasis ossea in which the eyes or adnexa have been compromised in order to secure a complete picture of the ocular complications and to suggest measures for relief.

Differential Diagnosis.—The diagnosis in a fully developed case is easy. Early cases have been confused with acromegaly, but the absence of involvement of the hands and feet and of changes in the sella turcica are points to be noted.

Simple osteomata and sarcomata should be readily distinguished. The distinction between leontiasis and Paget's disease (osteitis deformans) is not always clear. Indeed, there are some authors, notably Prince¹ and Boit² who stoutly assert the essential identity of the two.

Etiology.—It is impossible at the present time to state that any one etiological factor is operative in all cases. That trauma may be a contributory, if not a basic cause, is pretty well proved by

1. Prince: Am. Jour. Med. Sci., November, 1902.

2. Boit: Arch. f. klin. Chirurg., 1912, xcvi, 515-573.

the appearance in some cases of the first bony boss shortly after and at the precise site of injury. Erysipelas and other infective processes of the soft tissues have in some instances seemed to bear a causative relation. Dacryocystitis, when present, is probably secondary to the bone disease. Chronic inflammatory changes in the nose and sinuses may have some influence. There seems no good reason to suppose that the pituitary body bears any relation to this disease. There is wide divergence of opinion as to the rôle of syphilis, if any. Poisson insists that leontiasis is a trophic disease, of neuropathic origin. Virchow attributes it to periostitis.

The microscopic appearances have been described by Boit and his findings have been summarized by Telford³ as follows: "The spaces seen in the porous bone are bounded by thin walls of bone; these septa are lined by many osteoblasts by the action of which irregular osteoid bone is produced. A similar type of bone appears to arise also by the direct conversion of connective tissue which is very abundant in the diseased areas. Hand in hand with these processes, there occurs an absorption of bone which results in the formation of spaces and canals. The thin-walled vessels in the bone bleed easily and hemorrhages are common. On the whole, this new formation of bone appears to preponderate slightly over the destructive changes so that the net result is a steady increase in the size of the diseased bone."

Treatment.—While there is a wide divergence of opinion as to etiology, there is practical unanimity that any form of medical treatment is unavailing. It has been found that removal of the bony masses on the frontal and parietal bones is occasionally effective in relieving headache. The complete blocking of the nasal passages in some cases has led to efforts to reestablish patency by chiseling through the obstructing bony masses. Putnam has suggested that the bone might be starved by shutting off its blood supply.

Of special interest to ophthalmologists are measures which have been suggested and carried out to ameliorate the ocular complications. Horsley, in a patient with unilateral exophthalmos and diplopia, due to a large frontal growth which extended into the orbit, removed the mass together with the anterior two thirds of the orbital roof, resulting in recession of the globe and abolition of diplopia. Optic neuritis and beginning optic atrophy due to pressure on the optic nerve as it passes through the nar-

3. Telford: *Med. Chronicle*, lix, 85-92.

rowing optic foramen, demand even more radical measures. In such a case, Horsley removed the roof of the orbit as far back as the sphenoidal fissures, the major part of the great wing of the sphenoid, the upper part of the malar bone, and finally, in order to relieve pressure on the nerve, resected the lesser wing of the sphenoid.

Kanavel found that in fifteen cases with well-defined symptoms of cerebral compression, only four presented eye symptoms "suggesting that the optic neuritis may be as much due to local changes in the orbital cavities as to the cerebral pressure." Should, however, signs of increased intracranial pressure arise a decompression should be considered.

CASE REPORT

H. S., female, born 1873, the seventh of a family of thirteen children. Birth normal. Breastfed but weakly. Always "delicate." At 10 years patient noted difficulty with respiration and had trouble in speaking plainly "as there seemed to be some obstruction back of the palate." Growths back of the palate (adenoids?) were removed by a physician. Had several attacks of pneumonia. A few years later she was treated for "catarrh" by cauterization of the nasal mucosa. At 17 years she began to notice a swelling at the inner corner of her left eye involving the nasal process of the superior maxilla. (That the swelling may have begun earlier is suggested by childhood photographs which show abnormal bone development between the eyes). Other hard masses appeared, especially in the orbital plates of the frontal bone in the region of the superciliary ridges and on the nasal process of the right superior maxillary bone. In the meantime the nasal passages were becoming very narrow, and in 1903 she consulted Dr. John A. J. James, who found a practically complete bony occlusion. There was complete anosmia and frontal and temporal headache, often very severe. At this time the patient was also under the care of Dr. Carl Fisch. In 1907 she was referred to Dr. W. W. Graves, who very kindly permitted me to examine her eyes. (Dr. Graves will shortly publish a complete report of this case.)

Ocular Examination.—Feb. 11, 1907. Both globes very prominent and widely separated (wears glasses prescribed by an oculist ten years before which measure 75 mm. in width, indicating that even at that period there was notable separation of the globes). Pupillary distance is now 81 mm. Moderate epiphora, both.

On viewing the patient in full profile, it is seen that the apex of each cornea is well in advance of the level of the nasal bridge. The right globe is pushed downward to a level 4 mm. below that of the left. Distance between inner angles 41 mm. Patient can completely close both eyes, but only by a distinct effort. Width of head at level of eyebrow, 14.5 cm. Width of face at level of malar bone, 10.5 cm. Palpebral apertures slant downward and outward, making an angle of say 15 degrees with a horizontal line; right palpebral aperture 11 mm., left 10 mm. wide. When the patient looks directly forward, 2.5 mm. sclera is visible



Fig. 1.—Photograph taken in 1907. Lips retracted to show spacing of teeth. Note rounded bony bosses on either side of nose.



Fig. 2.—Photograph taken in 1907. Shows outward deviation of left eye on attempt to converge. Complete bony occlusion of nose compels patient to breathe through mouth.

below cornea in right eye, 1.5 mm. in left eye. On attempted fixation of an object held 50 cm. or nearer, left eye deviates out. (See Fig. 2.) On attempted version to the right, right eye limited, left eye very much limited (goes only 20 degrees past median line, then comes to a full stop and cannot be made to move farther by any effort of the will). Right eye continues to the right after the left eye has come to a full stop.

Levoversion. Right eye stops 20 degrees to nasal side of median line. Left eye continues to within 4 mm. of outer angle. At position of extreme right and left version there is marked crossed diplopia. Upward rotation quite free, both eyes diverging. Downward rotation fair, left eye deviating outward.

Right vision 5/5. Left vision 5/6. Ophthalmoscope: Right, eyeground normal; left, disk margin veiled, up and in.

Maddox test: Exophoria, 30 degrees. No hyperphoria. Eyes out behind screen.

Form fields (see diagrams): Full O.D. Slight superior and temporal contraction, O.S. Color sense normal. No central color scotomata.

Refraction: Right + .5 5/5. Left + .75c x 15° 5/8.

May 4, 1907: Ophthalmoscope: As at first examination October 17: Decided general improvement. (Has been on calomel gr. 1/20 t.i.d.) Feb. 8, 1908: Exophthalmos not diminished but patient feels subjectively much better. While manipulating the right eyelids, the right globe suddenly shot forward in front of the lids and remained proptosed for a moment or until the patient by gentle manipulation pressed it back into the socket. Patient not seen again until Oct. 30, 1913. Right + 1. Vision 5/8. Left + .5 + .75c x 30 5/8. Both globes have receded somewhat.

Both disks are somewhat pale, especially temporal halves, the margins not distinct, both arteries and veins narrowed. Visual fields both concentrically contracted, L>R. The narrowing of the fields, taken in conjunction with the failure in vision and the appearance of the disks, justifies the diagnosis of partial atrophy consecutive to neuritis.

Jan. 13, 1914: No change ophthalmoscopically. Vision as before. The most recent observation, July, 1915, gave me the chance to compare facial measurements and ocular movements made in 1907 with those made in 1915.

COMPARATIVE MEASUREMENTS

	1907	1915
Corneal apices	In advance of nasal bridge	2 mm. behind nasal bridge
Position of globes.....	Right 4 mm. lower than left	Right 1 mm. lower than left
Bitemporal diameter	16.5 cm.	16.5 cm.
Bimalar diameter	10.5 cm.	10.5 cm.
Pupillary distance	81 mm.	73 mm.
Between inner angles.....	41 mm.	39 mm.

MOTILITY OF GLOBES

Dextroversion	Left restricted	Left free
Levoersion	Right restricted	Right free
Upward rotation	Restricted	Free
Downward rotation	Left eye deviates out	Left eye deviates out
Diplopia	On rotation to right and left	None
Exophoria	30 degrees	4 degrees
Convergence	Up to 50 cm.....	Up to 8 cm.

SUMMARY

During the eight years the patient has been under observation, the globes have notably receded, the interpupillary distance has lessened, motility has increased and the convergence near point has withdrawn from 50 cm. to 8 cm.

During this period there has been a positive decrease in the size of the bony masses adjacent to the nose and a reestablishment of patency in the nasal cavities so that now nasal respiration is possible. Headache and neuralgia which formerly were very severe have practically disappeared. We are dealing, then,



Fig. 3.—Photograph taken in 1907. Note that apex of cornea is in advance of bridge of nose.

Fig. 4.—Photograph taken in 1915.—Note flattening of bony bosses and narrowing of pupillary interspace. Owing to re-establishment of nasal patency, lips can now be held closed.

with one of the exceedingly rare cases of leontiasis ossea in which improvement has taken place without surgical intervention. Opinion is practically unanimous that while the disease may show periods of inactivity, a cessation of the process with recession of the growths is not to be expected. The case reported, as well as one related by Bockenheimer, clearly shows that, while the statement above may be generally true, it is not invariably so.

SYNOPSIS OF CASES OF LEONTIASIS OSSEA SHOWING INVOLVEMENT OF THE EYES OR ADNEXA

Ager (*Arch. Pediat.*, 1909, xxvi, 14-19): Male child, aged 6. Diabetes insipidus. Head enlarged (a well-shaped not rachitic head). Skiagrams showed marked thickening of frontal bone

and orbital plate of malar bone. Marked bulging right frontal, malar, and upper part right superior maxillary bone. Eyes: Right exophthalmos. Epiphora.

Allen (*Australian Med. Cong.*, 1908, ii, 339-44): Male, age at death about 30. Disease began at 10, ascribed to kick in the face by a horse. Immense overgrowth of bones of face, involving especially the inferior and superior maxillae, malars, lacrimals, ethmoid, wings of sphenoid, vomer, lower part of the frontal and parts of both parietals. Eyes: Extreme exophthalmos, "eyes projected sideways like a lobster's," divergent strabismus. Dacryocystitis. Vision good.

Bardenheuer (*Deutsch. Med. Wchnschr.*, March 29, 1906, No. 13, p. 525): Case with blindness due to pressure on optic nerve.

Bickersteth (*Tr. Path. Soc.*, 1866): Began at 14. Observed at 30. General enlargement of facial bones. Eyes: Exophthalmos. Left eye became blind.

Bockenheimer (Patient originally of Scheier) (*Arch. f. klin. Chir.*, Berlin, 1908, lxxxv, 511-548): (1) Hyperostosis beginning left frontal region, following injury. (Young girl.) Thickening of right lower orbital border, later on left nasal process. Eyes: Exophthalmos, uninterrupted stillicidium. Vision diminished, diplopia (at times), due to strabismus divergens. Myopia. This case was subjected to Hg inunctions and K.I. "without effect." Fifteen years later came under Bockenheimer's observation enormously improved; great recession in bony growths, no exophthalmos, stillicidium or strabismus.

Cole: (*Quart. Bull. Northwestern Univ. Med. School*, September, 1909, xi, No. 2, 141-147): Male, aged 22. Trouble from 2½ years. Convulsions. At 7 swelling under right eye, later swellings lower and upper maxillary bones. Large bony masses either side of nose and left lower maxilla. Complete occlusion of nose. Eyes (Dr. George F. Suker): Bilateral exophthalmos, conjunctival hyperemia, reduced sensibility in each cornea; right suppurative dacryocystitis. Moderate choked disk (both). Pupillary reactions sluggish, slight restriction in motility.

First Operation.—Bony bosses, together with part of floor of each orbit removed. An opening three-quarters of an inch in diameter was made directly back through the bone to the posterior pharyngeal vault. After operation Dr. Suker noted recession of the exophthalmos, cessation of conjunctival hyperemia, diminution in choked disk, reappearance of corneal sensation, normal ocular excursions. At a second operation bony masses on lower jaw were removed; nine months later a decompression helped the headache.

Dupasquier and Dufour (*Bull. de la Soc. Med. des Hop. de Lyon*, May 1914, pp. 364-66): Female, aged 46. Syphilitic (several miscarriages and Wassermann plus). Severe headache. Bony masses either side of nose (beginning two years before). Nasal passages obstructed almost completely. Eyes: Visual failure, due to optic neuritis.

Ellis (*Arch. Ophthalm.*, xxviii, No. 4, 379-385): Male, aged 60. Temporal and infra-orbital enlargements. At 39, exophthalmos first observed. Aged 48, left vision failed. Right vision affected soon after. Several abscesses; nose blocked. Anosmia. Eyes: Exophthalmos; great limitation in motility. Right, p.l. Left, 18/30 (field contracted). Optic atrophy, both. Vision finally failed to complete blindness in both.

Fischer (*Deutsch. Zeitschr. f. Chir.*, 1879, xii, 57): Female, aged 30. Growth involved orbit, superior and inferior maxillae. Eyes: Both eyes blind. (Cause of blindness not stated.)

Gunn (*Lancet*, July 11, 1885, p. 67): Female, aged 22. Symmetrical enlargement of the upper half of the face. Thickening and tenderness of the superior maxillary bones. Eyes: Exoph-



Fig. 5.—Photograph taken in 1915. Note recession of exophthalmos and flattening of bony boss on right side of nose.

thalmos, right pupil active. Left, faintly active. Failure of vision (both disks atrophied). Veins large and tortuous.

Hankel (*Berl. klin. Wochenschr.*, 1884, xxi, p. 560): Left side of face especially zygoma is enlarged. Lower part of the orbit is larger than normal. Eyes: Total corneal staphyloma with phthisis bulbi; conjunctiva inflamed; lower lid shortened to such an extent that eye cannot be closed.

Heath (*Garretson's System of Oral Surgery*, Third Edition, p. 824): Hyperostosis implicating orbits. Eyes: Double lacrimal abscess, exophthalmos. Eyes lost, one from inflammation, the other from a blow.

Horsley (*Practitioner*, London, 1895, lv, 12-25):

CASE 1.—Male, aged 19. Bony growth principally over left eyebrow, extending to parietal and occipital bones. Growth projected into orbits. Eyes: exophthalmos down and forward.

CASE 2.—Male, aged 28. Trouble began as an exostosis on each side of nose. Later ramus of jaw on right side, right inferior maxilla and left inner half of floor of orbit involved. Eyes: right exophthalmos, no diplopia, epiphora. Ocular movements normal. Both disks atrophic. Right, vision perception of light, left, vision "impaired."

CASE 3.—Female, aged 13. Left frontal tumor reaching down to orbital margin at outer side. Eyes: double vision. Operation; tumor removed together with the roof of the orbit in its anterior two-thirds. One year later slight ptosis and exophthalmos.

CASE 4.—Bony growth right side of forehead and frontal region. Orbital margin thickened. Eyes: right eye, exophthalmos down and forward. Vision "abnormal." No diplopia. Fundus normal. *Operation*.—The roof of the orbit as far back as the sphenoidal fissure, the major part of the great wing of the sphenoid and the upper part of the malar bone were removed by operation. At the back of the orbit the optic nerve in its sheath and the structures passing through the sphenoidal fissure were laid bare by resection of the small wing of the sphenoid. Horseley expresses the opinion that leontiasis ossea is a "hopeless" condition for which operation offers considerable relief.

Howship (*Practical Observations in Surgery and Morbid Anatomy*, London, 1876, p. 22): Male, aged 40. Hyperostosis of frontal and superior maxillary. High grade exophthalmos. One eye lost from inflammation, the other from a blow.

Ilg (*Einig. Anatom. Beobachtungen Von der Sueck*, Prague, 1822): General hyperostosis of the head. Eyes: blindness.

Kanavel (*Surg. Gynec. and Obst.*, 1907, iv, 732): Male, aged 30; growth since 20. Excessive development superior maxilla. Cranium not enlarged. Eyes: dacryocystitis and optic neuritis (bilateral).

Lagleyze (*Ann. de Oftal.*, June, 1914, xvi, No. 12, 529-536): Male, aged 19; history of injury to root of nose at age of 12. Superficial injury promptly healed. Five months later root of nose began to increase in volume, likewise the cheek bones, enlargement of inferior maxillae. Two years later supra-orbital pain and enlargement of nasal bosses. Eyes: Severe ocular suppuration resulting in blindness. Right, adherent leucoma with atrophy of the globe. Left, several leucomata with posterior synechiae (optical iridectomy performed).

Law (*Med. Press and Circular*, Feb. 6, 1907, p. 147): Male, aged 13. Bilateral infra-orbital growths. Exophthalmos outwardly. Bilateral dacryocystitis.

Nauwerck (*Dermat. Studien. (Hamb. u. Leip.)* 1910, xx, 621-630): Body of 21-year-old male. Necropsy sixteen hours after death, Feb. 5, 1910. Extraordinary enlargement of the whole head. Frontal region, especially the tuberosities are greatly developed. Right temporal bone bulged out. Enlargement of the lower jaw. Right orbital margin thickened to 3 cm. The orbit narrowed by encroachment of bony masses from behind and to the outer side. Left orbit also narrowed but to less extent than

right. Eyes: right exophthalmos, subconjunctival hemorrhage; right nerve head pale, well defined, a little cupped, with widened blood-filled veins. Left, slight exophthalmos. Left nerve head reddened. Examination of the skull showed the right optic foramen much narrowed by bony growths. The right optic nerve as far as the chiasm is flattened, gray and atrophic. The left

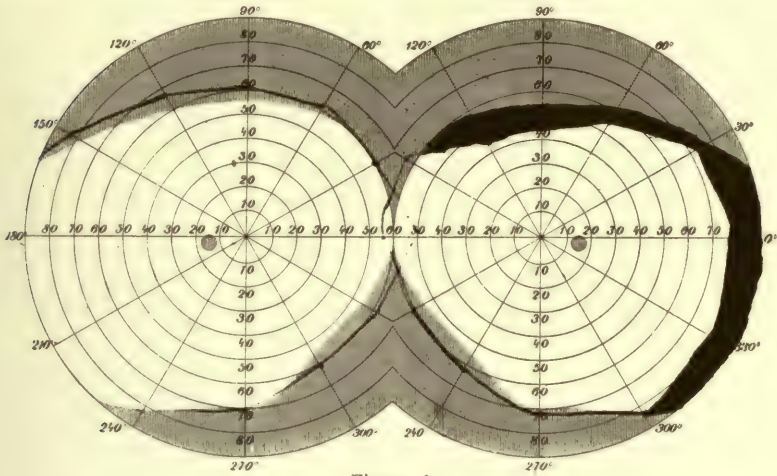


Figure 6.

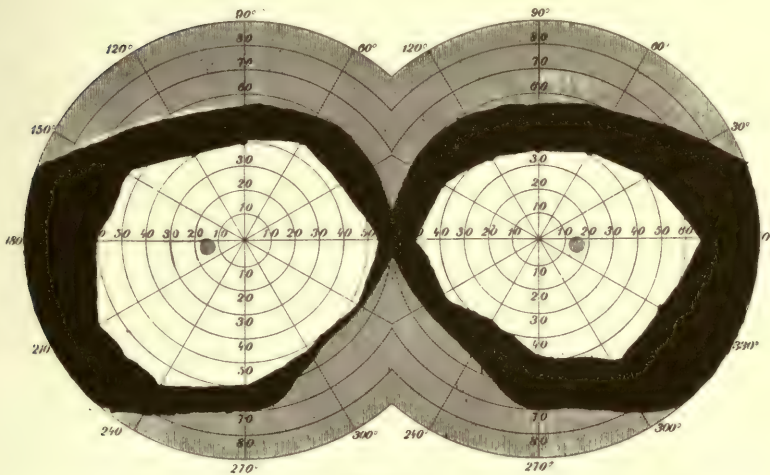


Figure 7.

nerve normal. Serological examination of the heart's blood showed a 3 plus Wassermann. The following history was obtained from relatives:

Parents died about 40 of unknown cause. Bony enlargement of lower jaw began at age of 3. At the age of 7 swelling on frontal bone gradually enlarged and spread. A picture postcard

taken four years before patient's death showed the characteristic cranium of leontiasis ossea with well-marked right exophthalmos. Right vision failed to blindness. Left vision "weak."

Noble (*Brit. Med. Jour.*, Dec. 5, 1896, p. 1637): Male, aged 20(?). This case represents the most hideous deformity of any case so far pictured. Tremendous enlargement of bone at either side of the nose, so that eyes are separated enormously. Distance from one inner angle to the other 1.5 cm. Eyes: palpebral apertures slope up and out. No apparent exophthalmos. Vision not recorded.

Pizzorno (*Resoconto clinico statistico degli ospedalia di Geneva*): General hyperostosis of skull and face. Eyes: Visual failure. Neuritis optica.

Putnam (*Am. Jour. Med. Sc.*, July 1896):

CASE 1.—Female, married. Symptoms first observed after first confinement at 19. Headache, pain in ears and eyes. Deafness, double facial paralysis, generalized enlargement of cranium. Eyes: exophthalmos, bilateral. Right, pallor of disk. Left, dense, defined, spicule of cortical lens opacity. Owing to uneasiness of patient no view of fundus obtained.

CASE 2.—At the age of 5, unconsciousness following fall, later epileptiform convulsions. Two broad exostoses on top of head, forehead rounded, frontal bone grooved; occipital prominence marked. Eyes: exophthalmos, bilateral mild optic neuritis. Vision failed almost to blindness. Death.

CASE 3.—(Patient of Prince.) Swelling of frontal bone after trauma, headache, mental dulness, hemiparesis. Eyes: Exophthalmos. Partial atrophy, right optic nerve. Retinal hemorrhages. Vision impaired. Necropsy; frontal bone enormously thickened, orbital and anterior cranial fossae much diminished. "The convolutions of the frontal lobes were plainly compressed between the orbital plates below and the frontal bone above."

Ribel, quoted by Baumgarten (*Thèse de Paris*, 1892): Male, aged 46. Superior maxilla; orbits contracted between 20 and 30 followed by proptosis. Dacryocystitis.

Sattler (*Tr. Am. Ophth. Soc.*, 1900-02, ix, 59): Began at age of 11, observation at 20. Bony swelling began in superior maxilla, left side larger than right. Eyes: epiphora, stricture of the left nasal duct. Exophthalmos, left greater than right. At 19, optic atrophy both.

Stark (*Bristol Med. Chir. Jour.*, 1900, xviii, 316-320): Male, observed at age of 21. Death at 41. Entire skull and head enlarged uniformly. Eyes: vision normal; orbits contracted vertically and horizontally. Eyes not displaced. Dacryocystitis with complete occlusion of bony duct.

Virchow (*Krankhafte Geschwulste*): Following evacuation of a lacrimal abscess bony growth right superior maxilla, rapidly spread to other parts. Eyes: exophthalmos, myopia, finally blindness. Death at 45 years.

Wrany, quoted by Baumgarten (*Thèse de Paris*, 1892): Anterior portion of cranium mostly involved. Right tear duct

closed. All vascular and nerve canals surrounded by excrescences but not contracted.

Young (*Brit. Med. Jour.*, 1896, ii, 1303) (pictures very closely resemble condition in case reported): Male, began at age of 30. Death at 46. Bony bosses on either side of nose. Prominence and thickening of the supra-orbital ridge on each side. Orbit diminished in size. Eye symptoms: vision "weak"; exophthalmos and ectropion.

Ziehl (*Archiv. f. Path. Anat.*, 1883, xci, 92-105): Hypertrophy of the right superior and inferior maxillae encroaching on the eye and nose. Skull not involved. Lesion began in childhood. Eyes: right, slight exophthalmos; right strabismus convergence. Right iris diameter larger than left iris diameter. Pupils equal; right myopic; left emmetropic. Ophthalmoscope, negative.

DISCUSSION

DR. OLIVER TYDINGS, Chicago:—I will present a photograph of a case which came under observation in 1913. Instead of involving the face so low down as the one shown, it involved the upper part of the orbit. I entered through the frontal sinus, which was very vascular, chiseled out all the diseased bone I could and went to the lesser wing of the sphenoid. There was $1\frac{1}{2}$ mm. swelling of the left optic nerve, vision 20/40, and a slight swelling of the right. The right cleared up and vision when last seen was normal in both; but when I last examined the case, about a year ago, there was swelling of the left. There has been some return of the growth since the operation, but she had not consented, when I last talked with her, to have anything further done. I put the patient on iodine after the operation. It had existed nine years before the operation.

DR. ROBERT SCOTT LAMB, Washington, D. C.:—Last summer when I happened to be in St. Louis I had the good fortune to see this patient with Dr. Green. She has improved 100 per cent. under the treatment since I saw her before. From the conditions and from the fact that it was found that mercury had some effect on this case, it struck me it might possibly be one of those cases of tertiary form from congenital causes. I passed my fingers over the forehead and found the condition I expected if that theory were tenable, because I had an experience previously of cleaning a skull of a tertiary syphilitic case. This case was not examined. There was a marked impression made on me while cleaning this cranium. You can see it from this remarkably splendid specimen. I asked Dr. Green to present this case at this meeting. We are apt to look for other causes. Instead of putting them to the hardship of operation without success, we may be able to help them, as he has been so fortunate as to help this patient.

DR. FRANK G. MURPHY, Mason City, Ia.:—I wish to report a case which is similar. A young man of 19 came to me six months ago on account of nasal obstruction. He had a hyperostosis of the entire left side of the face and exophthalmia of the left eye and the nose entirely occluded. I had to chisel out the ossified middle turbinate to get any breathing space. He complained of no headache or ocular symptoms of any other kind.

DR. J. GREEN, JR. (closing discussion):—The cranial bones Dr. Lamb has presented are very interesting. In the Army Medical Museum in Washington there is a complete skull which represents this disease in

its highest development—enlargement of the lower jaw as well as of the face and cranium. The earliest studies of this disease were made almost entirely from skulls in European museums. Not until Virchow cast the light of his intelligence upon this disease did we get data in reference to its clinical aspect. My patient went through a strenuous time with her nasal mucosa, which was treated, perhaps injudiciously, for several years. It seems conceivable that the oft-repeated traumatisms incident to the treatment may have had something to do with starting the process. Possibly the long-continued small doses of calomel may have had some influence in the improvement. Is this a spontaneous recession in the process, or is it due to the remedy? I am not prepared to say.

INTRADURAL TUMOR OF THE OPTIC NERVE

E. C. ELLETT, B.A., M.D.

MEMPHIS, TENN.

A. A., a negro girl, aged 3 years, was admitted to my service in the Memphis City Hospital, March 13, 1915, on account of unilateral exophthalmos affecting the right eye. The family history presented no points that would seem to have any bearing on the patient's present condition, and there was no tendency to tumors of any sort in any of the child's antecedents. The present condition was of a few months' duration and of gradual onset, being attributed by the parents to a blow on the eye which the child received by stepping on a hoop lying on the ground, so that it flew up and struck the region of the eye. As there was no evidence of any cut on the eye or neighboring skin it is doubtful if this injury was sufficiently serious to cause any trouble.

The only thing apparently wrong was the proptosis above mentioned; this was quite marked and measured 21 mm. with the exophthalmometer as compared with 11 mm. in the other eye. Besides protruding forward the eye was pressed a little downward, and while motion laterally was well preserved, vertical motion was entirely lost. The pupil was slightly dilated and did not respond to light. Externally the eye was entirely normal, as were the conjunctiva and lids. No evidence of light perception could be elicited, and several examinations by myself and my associates led us to conclude that the eye was blind. Nothing could be felt in the orbit by palpation, and on account of the proptosis and the fact that the tissues were quite soft this manipulation was easily and satisfactorily carried out. The eye ground was normal and especial mention should be made of the fact that the nerve head was normal in appearance. Roentgen-ray examinations and careful examinations of the nose by Dr. McKinney of the hospital staff were all negative, as was the general physical examination, urine and blood.

In discussing the case in clinic, the different causes of exophthalmos were mentioned, and by exclusion it was thought to be a case of some sort of orbital tumor, and probably a tumor of the optic nerve. Enucleation of the eye and tumor was done under general anesthesia March 31, the operation consuming twenty minutes.

As soon as the muscles were divided and the nerve located it was seen that this structure was materially enlarged, and in following it backward the enlargement persisted until the optic foramen was reached. The nerve was cut level with the foramen, and apparently the intracanalicular part of the nerve was affected by the same process which caused the enlargement of the orbital portion. Recovery was uneventful.

The enlargement of the nerve affected the whole of the orbital portion, as seen in the photograph. The enlargement measured



Fig. 1.—The patient showing unilateral exophthalmos.

nearly 3 cm. in length and 0.5 cm. in thickness. It was hardened in formalin and imbedded in paraffin and cut. The following report was made by Dr. H. T. Brooks:

“Microscopic study of specimen of tissue from tumor of optic nerve showed the following histological structure:

“The principal finding was a hyperplasia of tissue resembling—by the use of ordinary stains—connective tissue. This increase was present in and about epineurium, perineurium and to a less extent in the endoneurium. In other words, it was general throughout the portion of nerve trunk examined, and not localized.

“By the use of selective stains this hyperplastic tissue proved to be glia-tissue, chiefly neuroglia fibrils with relatively few glia cells. Diagnosis: Glioma, or a gliosis of the optic nerve.

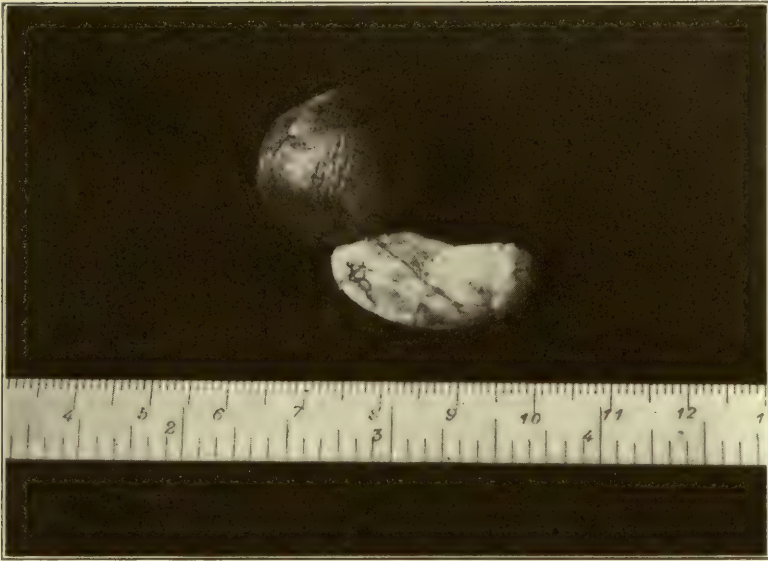


Fig. 2.—The tumor and eye ball.

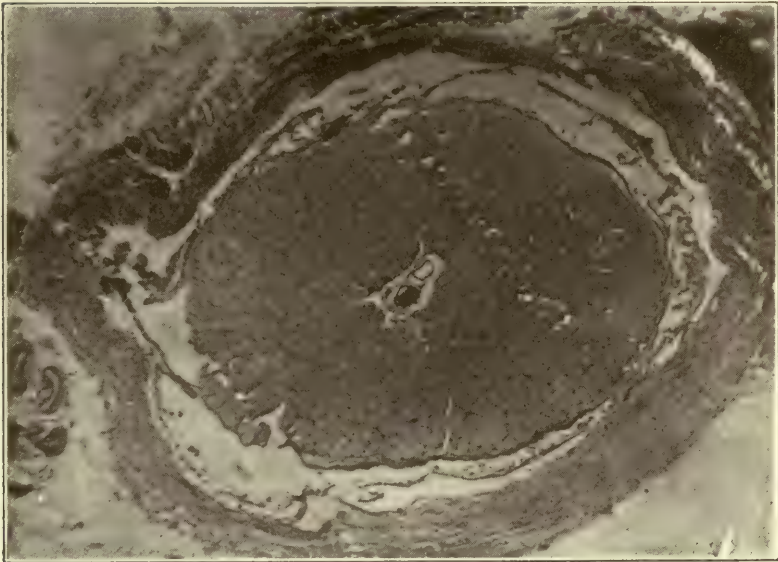


Fig. 3.—A cross section of a normal optic nerve.

"In this specimen the excess of neuroglia fibrils and relatively few neuroglia cells speaks for very slow growth. It is therefore, in my opinion, not malignant.

"In order to determine absolutely the character of this hyperplastic tissue, the following specific stains were employed:

- "1. Van Gieson's stain for connective tissue.
- "2. Mallory's anilin blue stain.
- "3. Phosphotungstic acid hematoxylin for neuroglia fibrils.

VAN GIESON'S STAIN

"With this the connective-tissue fibrils appear red or reddish brown. Neuroglia fibrils and muscle tissue appear yellow. This is not, however, a specific stain for neuroglia tissue but only connective tissue. This stain showed the major part of the hyperplastic tissue not to be connective tissue.

MALLORY'S ANILIN BLUE STAIN

"With this stain connective tissue appears blue, while the neuroglia fibrils appear red or light red. The blue shown in the specimen represents the normal connective tissue framework found in all nerve trunks, while the red or light red tissue is glia tissue. Practically all of this hyperplastic tissue takes this red or light red stain.

PHOSPHOTUNGSTIC ACID HEMATOXYLIN STAIN

"With this stain connective tissue appears red or reddish brown while glia tissue appears blue. Therefore the reddish brown areas shown in this specimen represent the normal connective tissue framework of the nerve trunk, while the blue tissue is glia tissue. Practically all the hyperplastic tissue in this specimen takes this character of stain."

Very full consideration of intradural tumors of the optic nerve can be found in Byers' monograph and in his paper read before the Section on Ophthalmology of the American Medical Association in 1914, and in Parsons' "Pathology of the Eye." Most of the published cases are characterized by an overgrowth of the fibrous elements, to which Byers gives the name "fibromatosis." Parsons endorses the name as well as the suggestion that the cause of this overgrowth is in an obstruction to the normal lymphatic circulation. In the case here reported, the tissue affected is plainly shown by differential staining to be the neuroglia.

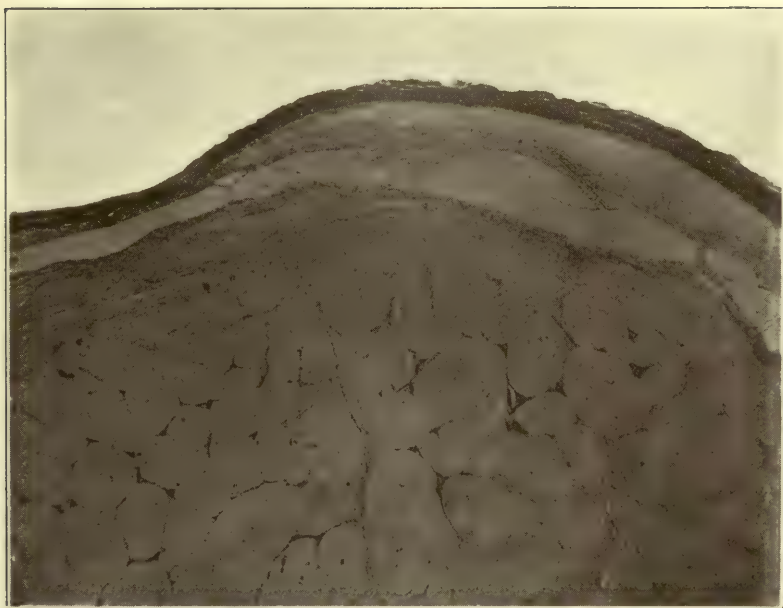


Fig. 4.—A cross section of the nerve in the case reported under same magnification as No. 3.

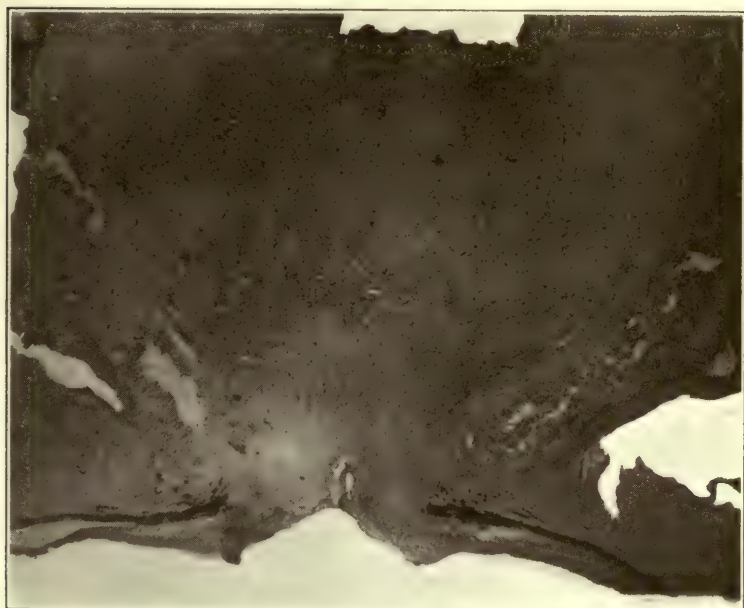


Fig. 5.—A section showing the entrance of the nerve into the eyeball. The papilla is not involved.

Clinical features of this condition to which attention might be called, are the early age of its incidence (Parsons thinks they are probably congenital), the slow growth, slight malignancy and absence of metastases. According to Byers, the intracranial prolongation of the disease is usual.

Nothing can be done in the way of treatment except removal of the tumor, which often means removal of the eye as well. An attempt to remove the tumor alone can be made by means of the Kronlein operation, or what Byers advises, the Knapp operation, of removal through a conjunctival incision, with canthotomy and temporary division of the rectus externus.

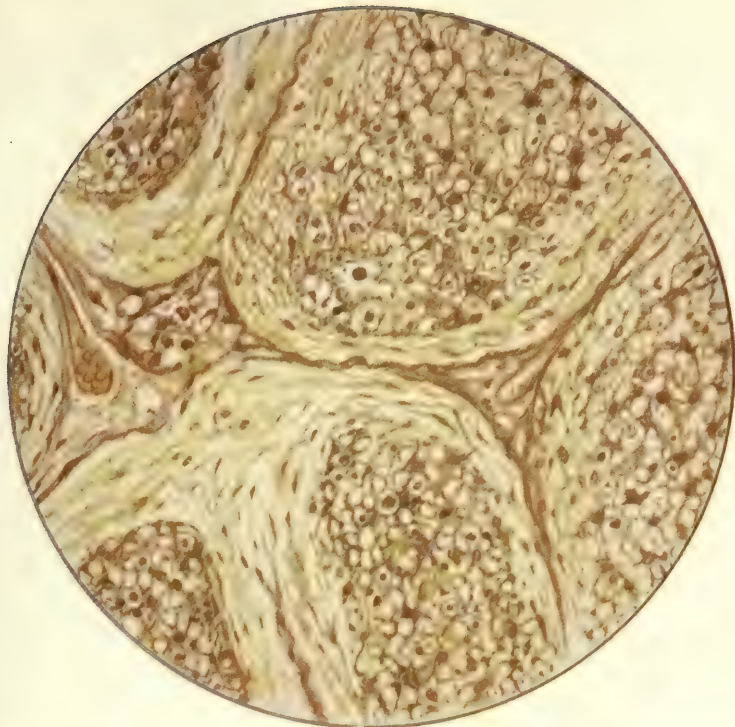


Fig. 6.—VAN GIESON'S STAIN. With this connective tissue fibrils appear red or reddish brown. Neuroglia fibrils and muscle tissue appear yellow. This is not, however, a specific stain for neuroglia tissue, but only connective tissue. This stain showed the major part of the hyperplastic tissue not to be connective tissue.

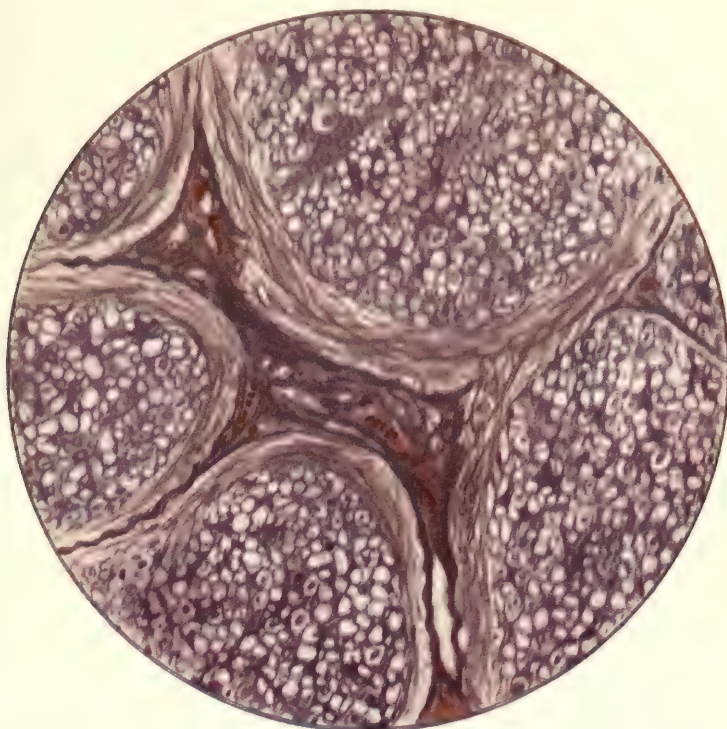


Fig. 7.—MALLORY'S ANILINE BLUE STAIN. With this stain connective tissue appears blue, while the neuroglia fibrils appear red or light red. The blue shown in the specimen represents the normal connective tissue framework found in all nerve trunks, while the red or light red tissue is glia tissue. Practically all of this hyperplastic tissue takes this red or light red stain.

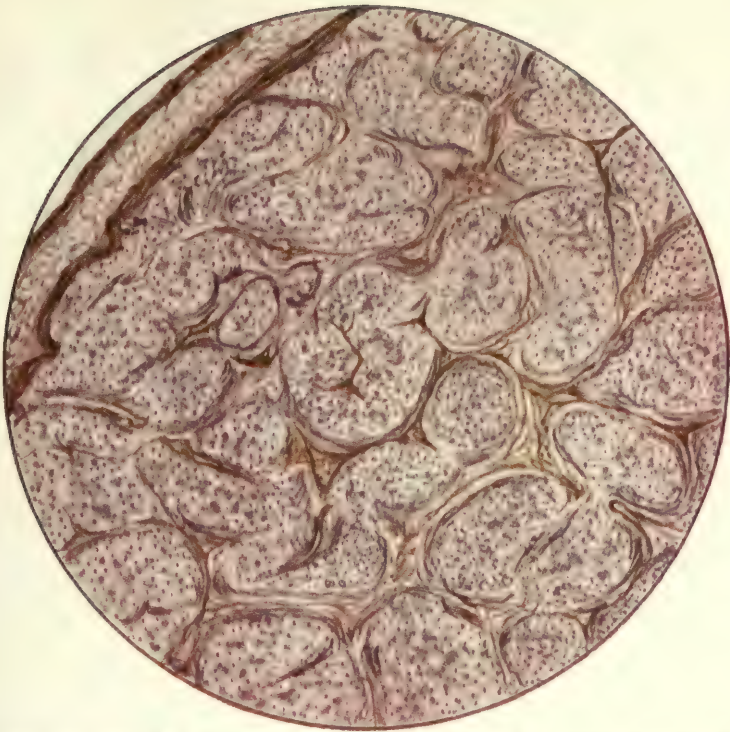


Fig. 8.—PHOSPHOTUNGSTIC ACID HEMATOXYLIN STAIN. With this stain connective tissue appears red or reddish brown, while glia tissue appears blue. Therefore, the reddish brown areas shown in this specimen represent the normal connective tissue framework of the nerve trunk, while the blue tissue is glia tissue. Practically all the hyperplastic tissue in this specimen takes this character of stain.

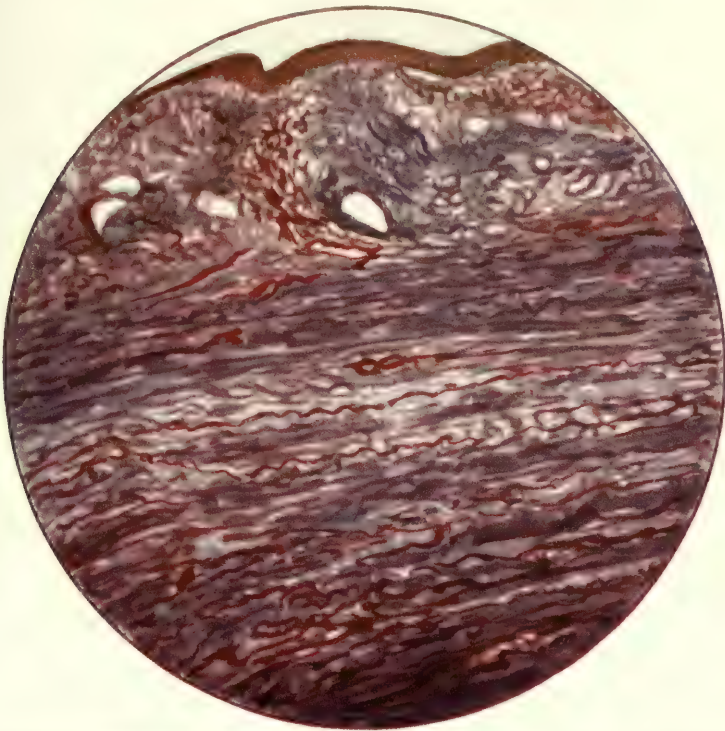


Fig. 9.—PHOSPHOTUNGSTIC ACID HEMATOXYLIN STAIN. With this stain connective tissue appears red or reddish brown, while glia tissue appears blue. Therefore, the reddish brown areas shown in this specimen represent the normal connective tissue framework of the nerve trunk, while the blue tissue is glia tissue. Practically all the hyperplastic tissue in this specimen takes this character of stain.

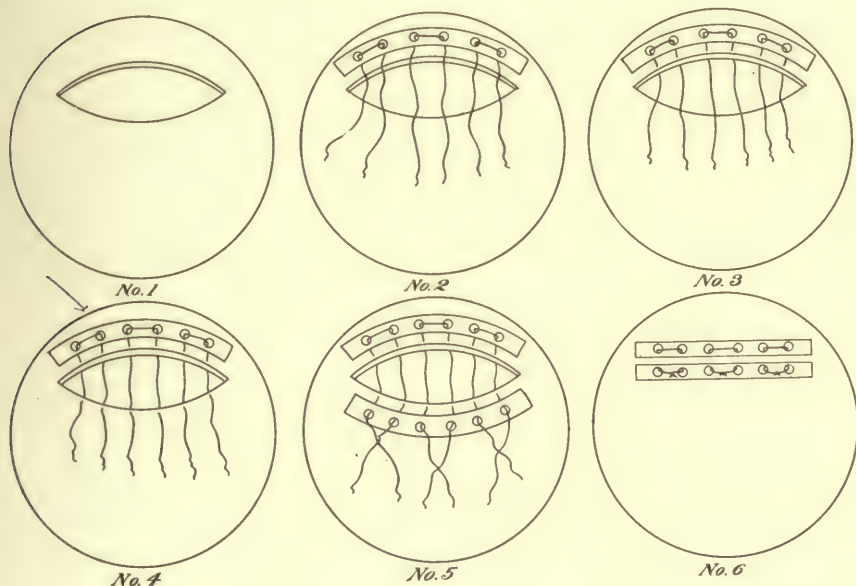
A NEW CORNEAL STITCH

MEYER WIENER, M.D.

ST. LOUIS

The experimental work with this stitch was done last winter in the surgical laboratory of Washington University Medical School, of which Prof. Fred. T. Murphy is director:

Rabbits were used for the purpose. The cornea was first measured with the keratometer. Then the section and technic about to be described was carried out. The principal is the same



The Description of Plates.

1. Elliptical incision of cornea near margin.
2. Gold strip, with double armed sutures already in place, ready to be passed through peripheral margin of cut.
3. Sutures passed through peripheral margin of wound.
4. Sutures passed through central margin of wound.
5. Sutures passed through second gold strip.
6. Gold strips in place, after completion of the operation.

as that of bringing together the gap in cleft palate. Gold strips 0.005 mm. in thickness and 1.0 mm. wide are used, with holes 1 mm. apart, according to the length of the wound to be sutured.

An elliptical excision is made in the cornea near the limbus. The object is to go as deeply as possible without penetrating

Descemet's membrane. The length is about 8 mm., and 3 mm. wide. Double-armed sutures are then passed around the gold strip through the small openings, then in turn through the central flap of the wound, through the limbus flap, finally through the gold strip to be placed on the opposite side, and then tied over the second strip with one tie. The stitches are alternately tied more firmly together until the wound is approximated.

The amount of tension which this form of suturing will overcome seems to be almost unlimited. If there is no infection, they will not pull through, providing the technic is good. The technic is difficult and delicate, but can be acquired by any experienced operator, with much practice. I have sewed up a rupture of the cornea produced by a blow, with this method, with entire satisfaction. I have also operated upon one case of conical cornea, the immediate result of which is most promising.

It is essential that the bored holes shall be polished, in order for the stitches to slide easily.

The method opens immense possibilities for experimental work on corneal curvature, including keratoconus, etc.

The work done in the laboratory will be reported in detail later.

EXHIBITION OF INSTRUMENTS

A DIRECT LARYNGOSCOPIC SPATULUM

OTTO GLOGAU, M.D.,

NEW YORK.

Ever since the vocal teacher Garcia first demonstrated a way of examining the interior of the larynx, the medical profession tried to improve his method. For diagnostic purposes the study of the inverted picture of the larynx as reflected in the laryngeal mirror proved to be a wonderful achievement. The performance of intralaryngeal operations was, however, quite difficult in many instances. The goal to be reached was the replacement of this indirect method by the direct inspection of the larynx and deeper respiratory passages. Kirstein first applied the so-called auto-scopic spatulum by means of which the epiglottis and the base of the tongue were forcibly pushed backward to such a degree that the laryngotracheal tube could be directly inspected through the mouth. There was, however, no provision made for retaining the spatulum in position. It was therefore practically of no value in the performance of intralaryngeal operations. Killian first exposed the interior of the larynx and of the bronchi by introducing electrically illuminated metal tubes. The lumen of the metal tube emerging from above the upper teeth represented the straight continuation of the laryngotracheal tube. This ingenious procedure was later improved by Jackson, Bruehning and Kahler, and is still very much in vogue. The method of direct inspection of the larynx was revolutionized by Killian's so-called suspension-laryngoscopy. While in the other procedures the epiglottis and the base of the tongue were forcibly pushed backward, they were in Killian's new procedure automatically suspended on a spatulum that was attached to a kind of gallow arrangement. The interior of the larynx is perfectly exposed and directly accessible to operative interference. The suspension apparatus of Killian is, however, very expensive and rather complicated. Its use is almost exclusively limited to hospital work.

During my last stay in Berlin I saw the laryngeal spatulum of Stuycken. The underlying idea of this instrument was the pushing backward of the epiglottis and the base of the tongue by

lowering the spatulum on a fulcrum in the middle of the mouth. The construction of the instrument was, however, such a primitive one that the spatulum always slipped from its fulcrum, whenever the instrument was introduced. Besides, the size and shape of the spatulum were such that an exposure of the larynx could not be obtained. The underlying idea of moving the spatulum on a fulcrum in the center of the mouth struck me as a good one. Based on this principle, I constructed a handy and inexpensive instrument for direct inspection of the larynx that combines the



Figure 1.

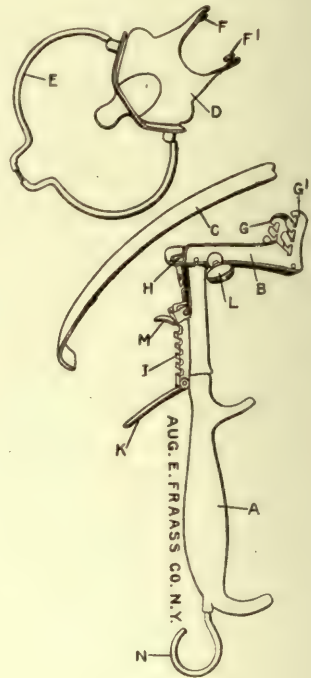


Figure 2.

advantages of both Kirstein's autoscopic spatulum and Killian's suspension laryngoscope.

The latest model of the instrument consists mainly of the palate plate (D), the tongue depressor consisting of the tongue plate (B) and the handle (A), and of the spatulum (C), gliding within a sliding arrangement (H) of the tongue plate. The sliding spatulum may be fastened in any position by means of the screw (L). At the innermost end of the tongue plate there is attached under

a right angle an arrangement of teeth (G and G'), into which the connecting knobs (F and F') of the palate plate fit. The joint thus formed represents the fulcrum within the center of the mouth upon which the spatulum turns. At the outside end of the palate plate (D) there are two small universal joints in which a heavy metal ring is movable. The narrow center piece of this metal ring fits into the teeth arrangement (I) on the handle (A). By closing the lever (K) and fastening it through the spring (M), the palate plate becomes immovably attached to the tongue blade and the handle. The instrument may be introduced under local or general anesthesia. In the upright position of the patient,

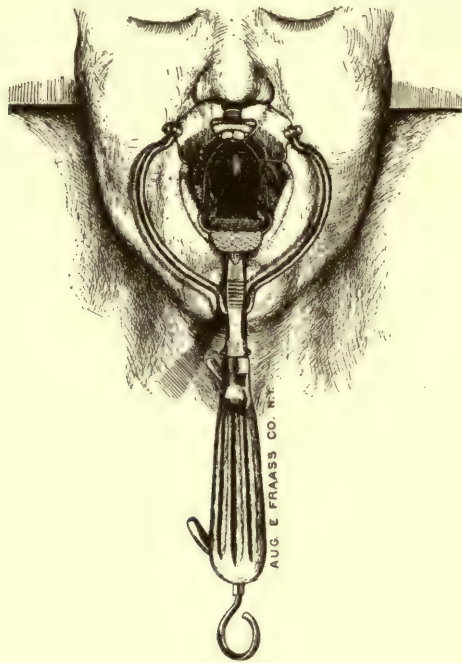


Figure 3.

the head is bent backward as far as possible. According to the size of the mouth, the knobs (F and F') of the palate plate (D) are locked into the lower or upper teeth of the fulcrum (G and G'). The metal ring (E) is then connected with the lowest notch of the teeth arrangement (I) and fastened in this position by means of the lever (K) and the spring (M). The operator stands in front of the patient. The patient is told to keep the tongue pulled forward. The instrument after being closed in the above-

described way is then introduced, till the palate plate rests on the hard palate in such a way that the upper teeth are just inside of the vertical teeth shield that forms the outer bounding line of the palate plate. The spatulum (C) is then introduced into the sliding arrangement (H) of the tongue blade (B) and made to glide downward alongside of the back of the tongue and over the epiglottis. The spring (M) is then opened, the lever (K) released and the metal ring (E) moved upward as far as possible and then fastened to the uppermost notch possible of the teeth arrangement (I), by closing again the lever (K) on the spring (M). Due to the curvature of the tongue blade and of the spatulum the notch-shaped inner end of the latter is about 2 inches below the level of its outer end. Thus the tongue and the epiglottis are pushed backward without any force by the construction of the gliding surface alone.

In the recumbent position of the patient, the head hangs over the table and is bent backward and downward. The operator stands behind the patient. The instrument is introduced in a way similar to the above described. Due to the position of the patient, the tongue blade will then form the roof of the exposed cavity and the palate plate its floor. By introducing the sliding spatulum the tongue and the epiglottis will become suspended on the end of the spatulum. Both in the upright and recumbent position a full exposure of the interior of larynx and the vocal cords is obtained. The instrument, though self retaining, may best be held in position by means of the handle (A). In order to expose the anterior commissure, the handle must be pushed further upward in the upright position of the patient and further forward in the recumbent position. In general anesthesia, the tongue must be pulled forward during the introduction of the sliding spatulum.

Figure 3 shows the exposure of the interior of the larynx in the recumbent position of the patient. The wide access to the exposed parts permits of easy operative interference. Straight instruments are used. Under guidance of the direct laryngoscopic spatulum the writer curetted the posterior laryngeal wall in two cases of laryngeal tuberculosis and removed in three cases papillomata from the vocal cords.

The illumination, though sufficient with the ordinary head-mirror and reflected light, is best by using an electric headlight, such as Kirstein's lamp, etc., or by attaching a small electric bulb directly to the palate plate.

The instrument is made by Aug. E. Fraass Co., New York.

GLASS SCREEN WITH ADJUSTABLE STANDARD

ALICE G. BRYANT, A.B., M.D., F.A.C.S.

BOSTON

It will be seen that this figure presents an upright support, that is bent at a right angle at its upper terminal; and from this horizontal extension, a framed pane of glass is suspended by means of two hooks. To be more explicit, this horizontal rod, six-sixteenths of an inch in diameter, is $17\frac{1}{2}$ inches in length. At its right extremity it terminates in a hook. At its left extremity it dips perpendicularly for 3 inches. There it curves outward to the left, until its maximum distance from a plumb line falling from the left extremity of the horizontal rod is $3\frac{5}{8}$ inches. At this point it curves inward toward the right, and finally assumes the perpendicular for 1 inch. The perpendicular distance between the upper and lower terminals of the rod measures $17\frac{1}{2}$ inches. This rod is encircled by an immovable collar at its lower extremity. Then the rod extends for $5\frac{1}{4}$ inches in a tube $6\frac{3}{4}$ inches long by $1\frac{1}{6}$ inches in diameter. The tube is mounted by a cuff, an inch in depth, upon which rests the immovable collar of the enclosed rod, by means of which the rod is kept from swaying.

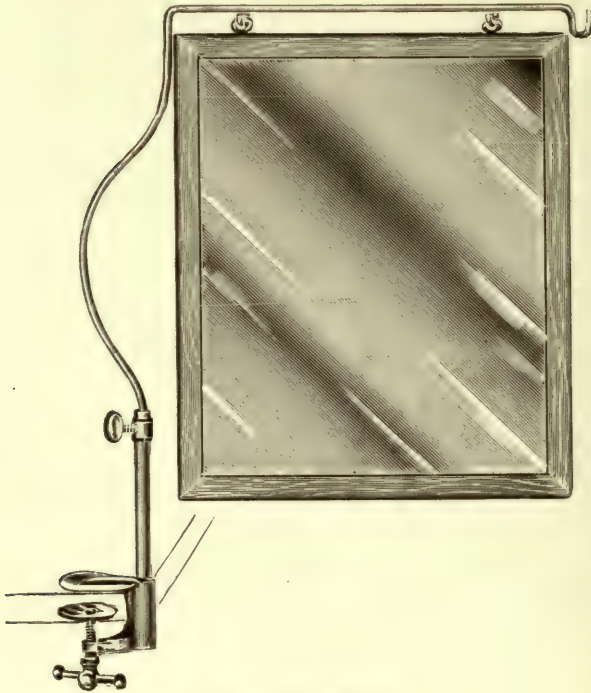
This rod can be raised or lowered in the tube. It can be adjusted as to height and securely fastened by means of a screw which passes through the outer side of the cuff of the tube, and thus the pane of glass may be conveniently placed as to height. Further this tube terminates in a fixed collar $2\frac{7}{8}$ inches deep. From the posterior surface of the collar project two stationary horizontal flanges that are separated for a distance of $1\frac{7}{8}$ inches. Through the lowest flange, at its outer extremity, a hole has been drilled and threaded, and an upright screw passes through it; and it may be made to impinge upon the under surface of the upper flange. One is enabled to clamp the iron standard to a treatment table, by turning the screw by means of the cross-beam handle. The screen is of plate glass mounted in an ebonized wood frame, and it is $19\frac{3}{4}$ inches in length by $16\frac{3}{4}$ inches in breadth.

What are the salient features of this apparatus?

The bowing out of the upright rod serves as a loop-hole for hand and forearm to pass between the screen and rod during examinations and treatments. Thus we avoid touching either

the screen or its standard. The screen is held lightly between the flexor surfaces of our forearms. The patient, by means of the hooked end of the horizontal rod, may easily swing the screen into position, or return it to its stall by a suggestion from the physician. For several reasons, a screen and standard of this device, or of a similar device, should be a necessary requisite for every ear, nose and throat treatment table.

First, the object in view is no small one, when we consider the sense of security it gives patients, in so far that they may



Bryant Glass Screen.

cough at the screen and not at the physician when their throats are undergoing an examination.

It clearly is a boon to sensitive patients.

Next, there is a relaxation on the part of the patient that is exactly what happens.

Further, it is very effective in permitting a more thorough and more prolonged examination.

And above all, it is more sanitary both for patient and physician.

AN EAR, NOSE AND THROAT TREATMENT TABLE

ALICE G. BRYANT, A.B., M.D., F.A.C.S.

BOSTON

Picture to one's self a flat top desk with drawers upon each side; upon the top a wooden hood has been constructed to conform approximately in breadth, height and width with similar measurements of the desk. Or, in detail, the separate figures required for the above are roughly notated as follows: height, 18 inches; length, 40 inches; width, 24 inches.

The box hood rests a few inches within the outer border of the desk top, and it is firmly secured in place by cleats. The sides and back and posterior half of the top are fixed in position. The front wall is divided into halves and hinged so that the lower half can be folded back on its upper section. The top of the box hood is likewise divided into two parts and hinged so that the anterior leaf will fall back and rest upon the fixed posterior section. Thus the front wall and the top are together, one above the other in four layers and they are out of the way, leaving the interior of the box hood freely exposed for a treatment table. An opal glass covers the desk top.

A shelf 6 inches in width is placed half way up the posterior wall, and it extends from side to side. The hood can be closed and locked, when not in use. A good way is to utilize some discarded desk with drawers. The added cost of construction of the hood is a negligible quantity, when we compare it with the cost of most of the treatment tables put on the market.

So far as its capacity is concerned, it is ample in size, and dust-proof when not in use.

AN ELECTRIC FOOT-SWITCH

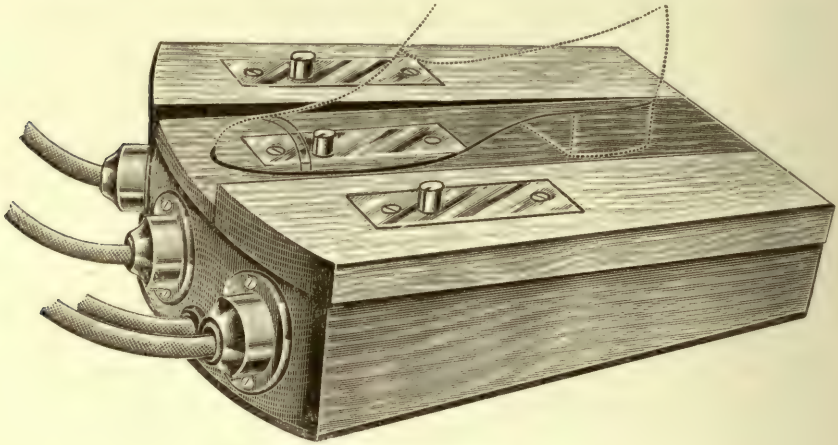
ALICE G. BRYANT, A.B., M.D., F.A.C.S.

BOSTON

The instrument to which I wish to direct your attention is an electric foot-switch. It is particularly suited to the office needs of the laryngologist and otologist. Without going into all the niceties possible, we may say: The electric foot-switch consists of a casing of a block of wood. The current is supplied to the foot-switch by means of a cord passing through a perforation in its

anterior wall. The anterior wall is also rigged up with three cords and plugs that serve as emitters of the current. These cords may be attached at one's pleasure to three machines at the same time.

On the upper surface of the block of wood, there are three brass rods placed widely apart and protruding an inch above the surface. By pressing the brass rod with the foot, the electric current is turned on; and, by again pressing the rod with the foot, the electric current is turned off. Thus the machines, with cords and plugs attached, stand ready for use; and by pressing a rod with the foot, we have a third hand. What is more, in this way we avoid soiling our fingers as we would do if we were to turn



Electric Foot Switch.

the current on and off in the usual manner. Further, by this method of controlling the current, we avoid using more electricity than we actually need. Among the many advantageous characteristics which have commended the above apparatus to my use, the more important may be summarized as follows:

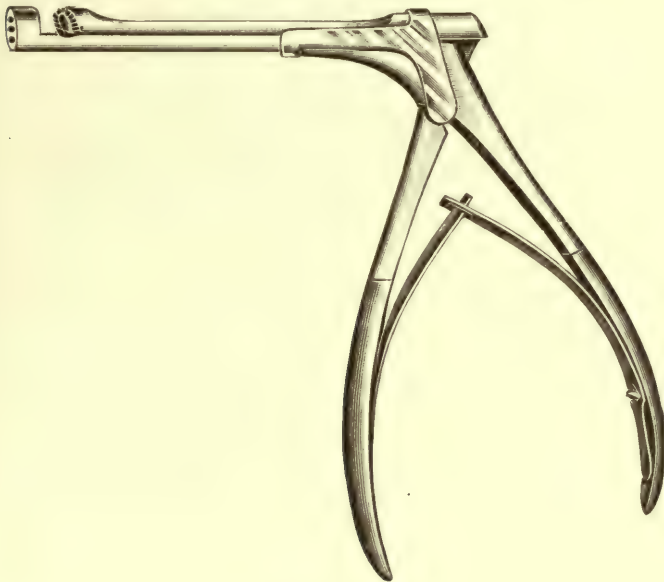
1. Operated in a cleanly manner.
2. Current on and off at will.
3. Omission of skilled office attendant.
4. Efficiency of service.
5. Simplicity of construction.
6. Ease of operation.
7. Ability to stand severe service.
8. Low cost of maintenance.
9. Direct communication with line.
10. Increased radius of operation from a single line or switch.

BONE-GRIPPING FORCEPS

ALICE G. BRYANT, A.B., M.D., F.A.C.S.

BOSTON

Let us consider a bone forceps, or what I like to call a gripping forceps. Many surgeons are probably familiar with the ordinary construction of these forceps. We will briefly refer to them. Two strong bowed handles are held apart by two powerful springs, which are attached to the inner surfaces of the handles. The springs interlock near the junction of the handles. The



Bone-Gripping Forceps

handles meet and cross by the fore handle, slipping through the hind handle. The hind handle from an angle of 60° continues on its way to make the lower horizontal blade. It is stationary and extends beyond the terminal of the fore handle, while the fore handle, which is movable, is extended from an angle of 70° to the horizontal and continues on its way to make the upper blade. It slides over the upper surface of the lower blade by peg and groove devices; and, at this point, I now pass to the terminals of the forceps, a device I wish to lay emphasis upon.

Several years ago, two patients presented themselves for operation. There existed an unilateral bony occlusion of the posterior nares with cystic condition of the antra. The walls

were abnormally thickened in places, shelving to thin places here and there, in cross section much like a "V" in shape. The half dozen or more different forceps I possessed, and many more that I had seen, did not appeal to me for the work in hand. Now I happened to notice that the opposing surfaces of the terminals of all these forceps met in parallel planes. Therefore, later, I decided to devise terminals with greater gripping power, and then I worked out the terminals to the above-described forceps. The lower blade I had made to terminate in a fenestrated hood, oval in shape, compressed from side to side and flattened at its base. This hood was made to serve as a receiver for material removed. In its distal wall three holes had been drilled to enable one to push out the contained *débris*. Whereas, the upper blade mounded up at its terminal, and its distal wall facing the hood was made to slant forward at an angle of $8^{\circ}+$, so that the apex of this surface would first impinge upon the bone. The upper blade slipped into the hood of the lower blade along the entire length of the hood. The distal surface of the upper blade was concave and its edges were serrated. When not in use the distal and proximal surfaces of the respective upper and lower blades at the base were separated at a distance of three-eighths of an inch. It now remains for me to refer briefly to the advantages gained by this kind of device. The reason is not far to seek. The forward projection on the upper blade with its concave surface and serrated edges enables one to take a firm hold of the bone and by this device to get rid of the evil of slipping. Thus the bone may be held between the two terminals of the upper and lower arms in grip-like fashion.

EAR, NOSE AND THROAT INSTRUMENT BOX

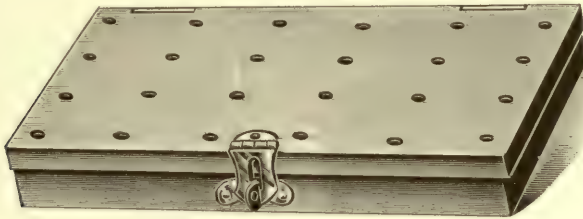
ALICE G. BRYANT, A.B., M.D., F.A.C.S.

BOSTON

Here is a diagram representing a small box containing the requisite number of ear, nose and throat instruments, conveniently arranged and easily sterilized, for house-to-house visits. It will be noted that the cover is provided with a series of holes, and the base is likewise perforated, as is also the posterior side. A hole has been drilled through the swivel key, through which a hooked wire may be passed. By means of this support, the box

may be placed in boiling water and removed from the same. The wire hook serves as an admirable handle for easily and quickly removing the box from its container and placing the box wherever desired.

The interior of the box is compactly provided with instruments, in two ways. In the first place there are those placed in its floor. Then there are those held in a tray that extends three-quarters way across the box. The tray is supported by means of four small pegs mounted in the floor. Then to enable the tray to be held securely in place, three upright pins arising from the floor are fitted into as many holes in the tray.



Instrument Box.

Now suppose we enumerate the instruments arranged in racks in the tray? From front to back we have:

- A folding tongue depressor.
- A stapes hook or foreign body hook.
- Two small needle-pointed knives.
- Two handles for the above needle-pointed knives.
- Dr. Jack's ear forceps.
- Dr. McKay's ear forceps.

Then in the bottom of the box, to the right of the tray, there are four to five ear specula, and a small nasal speculum held in place by forked supports. Other instruments found here and beneath the tray are two postnasal applicators that may be used in turn in one of the above knife handles. We find also a bullet-tipped probe, a chromic acid nasal applicator, a peritonsillar knife, two silver ear catheters, a laryngoscopic mirror, one dozen alumino-bronze ear and nose applicators.

The box is made of copper and it is nickered, and the tray consists of aluminum.

This case is $6\frac{1}{2}$ inches long, $3\frac{9}{10}$ inches wide and eight-tenths of an inch high.

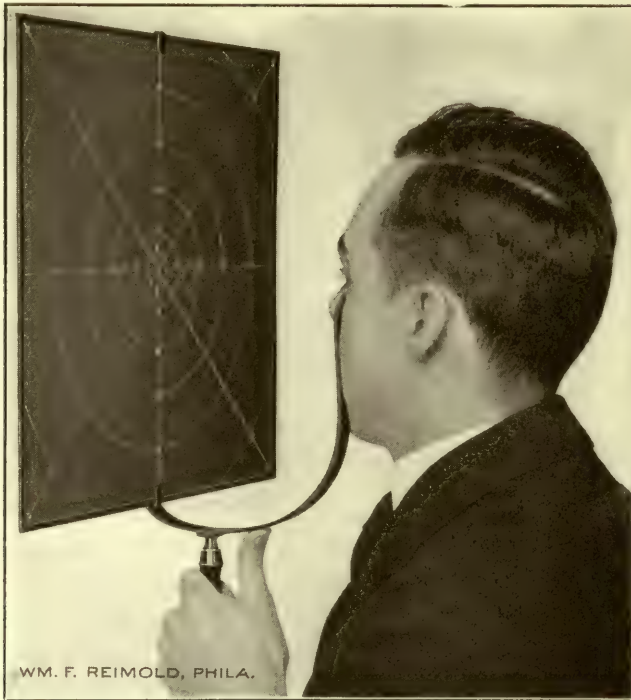
I may add that the box and its contents were manufactured by Codman & Shurtleff, the well-known makers of so many surgical instruments.

A NEW HAND CAMPIMETER

LUTHER PETER, M.D.

PHILADELPHIA

This is a campimeter which is not supposed to take the place either of the arc perimeter or the blackboard of usual size. The principal objection to the arc perimeter is its inflexibility, and therefore it is poorly adapted to the study of the central field. The principal objection to the large blackboard is its size and



The Hand Campimeter.

the difficulty of making studies with good daylight. This hand campimeter is compact, light, and may be carried to the bedside for study, or the patient can be placed without any inconvenience before a window where the best possible daylight may be obtained—the condition under which I believe all perimetric studies should be made.

The test objects are 2 mm. and 5 mm. discs. The size of the disc, however, may be varied to suit the physician's fancy. I

use the 2 mm. disc in studies within the 20 degree circle, and the 5 mm. disc beyond this area.

The normal blind spots are definitely located, and as charted on the campimeter, they are the average of studies made from between 300 and 400 patients. They are therefore placed with accuracy at the average distance from the point of fixation.

The face of the board is covered with only sufficient lines to do satisfactory work, and they do not therefore tend to distract the patient's attention.

The chart employed for recording results of examinations is an exact and relative reduction of the campimeter.

There is some confusion as to the exact size of the blind spot. One can therefore tell at a glance with this instrument whether the blind spot is normal or abnormal.

The instrument is intended to be used in selected cases. However, as it practically includes all the color fields of a normal individual, it will be found useful in a large proportion of cases to be examined.

DISCUSSION

DR. H. S. GRADLE, Chicago:—I had the pleasure of talking to Dr. Peters before the meeting and allowed myself one or two suggestions that might be of value. As the careful study of a central scotoma is a matter of time and the patient is apt to tire, a double fixation is advisable. This is best accomplished by introducing a small disc between the patient's eye and the center of fixation. Thus, should the patient tire, he can rest for a few moments and then resume the primary position. For the accurate measurement of the blind spot and central scotomata, I use a screen covered with thin paper, located 60 cm. from the eye. As a testing mark, a 3 mm. steel ball bearing is used and is rolled over the anterior surface of the screen, actuated by a small electro magnet behind the screen. This has the advantage that the patient sees only the testing mark and his attention is not diverted by any holding or containing rod in continuous motion.

DR. PETER (closing discussion on his instrument):—I simply wish to say this instrument is to be used for quick work in the office, not to take the place of the laboratory instrument Dr. Gradle has devised. This instrument could be adjusted so as to have a double fixation. In the hands of those who have used the hand campimeter, it has shown itself to be a very satisfactory method of studying the central field. The advantage of studying the central field at close range, I hope to take up in more detail in my paper tomorrow, on "Studies of the Normal and Abnormal Blind Spot of Mariotte."

AN ELECTRIC ATTACHMENT TO THE PHOROMETER

F. PHINIZY CALHOUN, M.D.

ATLANTA, GA.

A simple electric attachment to the commonly used De Zeng phorometer has proved quite useful in muscle testing for near work.

After determining the muscular balance for *distance* with the phorometer placed and adjusted before the patient's eyes, and using the Maddox rod before one eye, the test for *near* can be quickly made by swinging the arm which holds the electric attachment into view.

Onto the graduated 16-inch rod (a) which is attached to the phorometer (b), is placed a second smaller rod (c) 2 inches high, which can be readily moved to and from the patient by its base (d). There is a small frosted electric globe at the tip of the smaller rod, controlled by a socket rheostat. Behind the light and attached to the smaller rod is a dull black screen (e), 4 by 4 inches, which is used as a background.

On the opposite side of the black screen are two 1 mm. white lines placed at right angles and set in the center, and at their intersection is a 2 mm. opening, illuminated by the light on the opposite side, which acts as a fixation point. It is really the "dot-and-line" test so commonly used and can be employed here (without the Maddox rod) if desired.

DISCUSSION

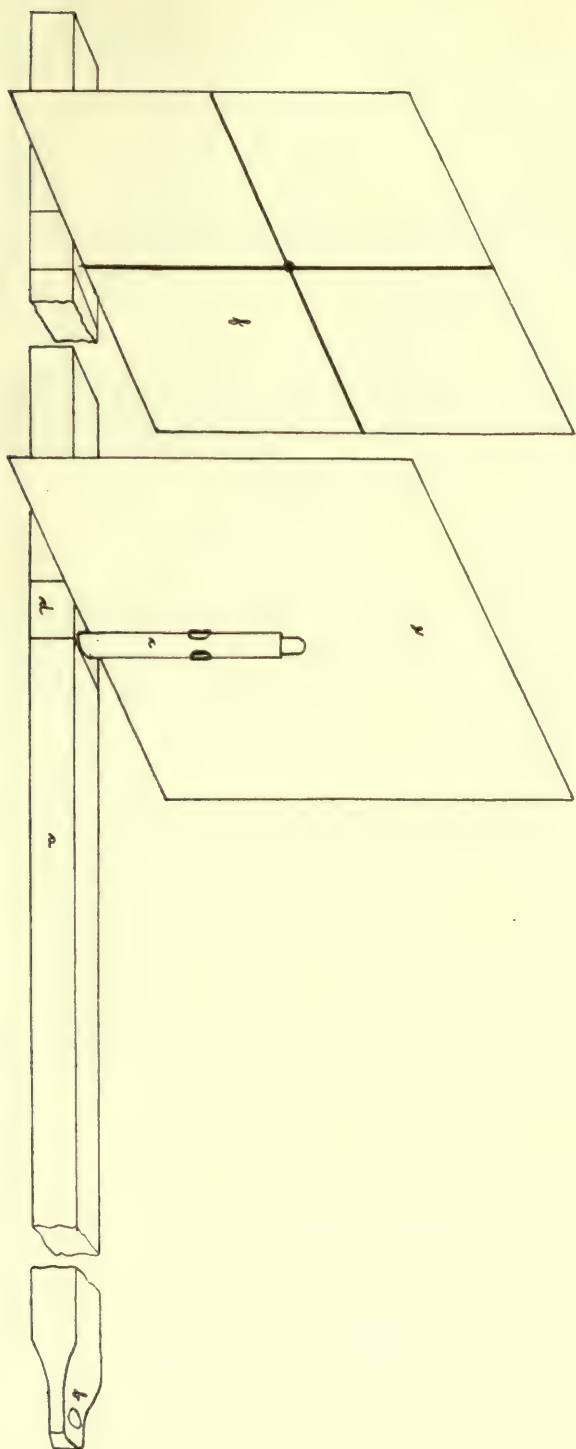
DR. WENDELL REBER, Philadelphia: May I ask whether this instrument is to be used in the horizontal position of the head, or can it be depressed to the usual plane of the eye as in reading?

DR. CALHOUN: No.

DR. REBER: I would consider that a disadvantage. It is an elementary fact that as we rotate our eyes upward there is a tendency to divergence, and downward there is a tendency to convergence. If the reading is made in the horizontal plane of the head we may get readings of a low-grade exophoria which will not be obtained in the other position. It is one reason I gave up any test in the horizontal plane of the head. Could not this device be adjusted to drop to the usual reading position?

DR. CALHOUN: A little. Dr. Lancaster suggested one could turn the head back and secure the same result.

DR. REBER: I would not trust the patient to do it. Moreover it again places the ocular muscles under somewhat faulty innervations and that is the very thing we should strive to avoid. The device is a most excellent one and with the slight modification referred to should give ready and accurate findings.

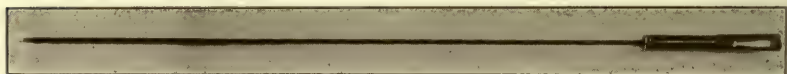


AN ELECTRIC POINTER

LOUISA PAINE TINGLEY, M.D.

BOSTON

This pointer consists of a handle, containing a battery and switch, a 3 mm. metal tube 23 inches long, containing the wiring, on the end of which is a tiny electric light, with frosted or clear globe, to suit the operator's fancy. Entire length of pointer, 29



Tingley's Electric Pointer.

inches. I designed the pointer to be used in conjunction with the "Duane Tangent Curtain," for mapping out scotomata and fields of fixation and single vision. The pointer has the advantage of being long, thus attracting the patient's attention to one single point, without distracting it by the sight of the operator's hand or cuff.

 TONSIL HEMOSTAT AND CHISEL FOR SUBMUCOUS RESECTION

W. D. BLACK, M.D.

ST. LOUIS

I have here a tonsil hemostat modified after our distinguished chairman, Dr. Beck. The only thing I claim for it is rapidity and you can use any pressure you want. I have also here two chisels for submucous work to cut off the ridge. I claim it is



very difficult to perforate with these chisels. Of course one can expect to do better work after a little experience with them.

The septum chisels are made by V. Mueller & Co., Chicago.

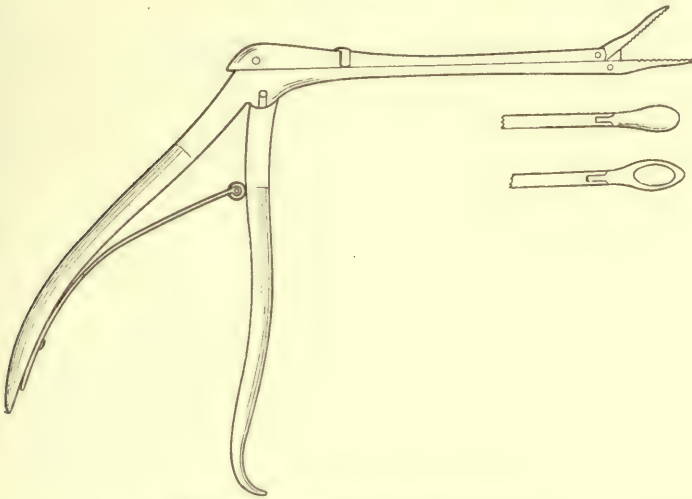
The tonsil hemostat will be made by V. Mueller & Co.

SUBMUCOUS SEPTUM RESECTION INSTRUMENT

T. S. BLAKESLEY, M.D.

KANSAS CITY, MO.

I have here an instrument that I use in submucous resection, and I have found that it is possible to rapidly fracture the perpendicular plate of the ethmoid and those vomers which are not too heavy, and at the same time it can be used as a dissector when the blades are closed. It has great power and it shortens the time of operation.



Submucous septum resection instrument.

Most instruments that grasp at the tip are thickest at the end in the direction they open, this is thin in this direction. This enables one to introduce the instrument, open it wide and grasp.

ETHMOID INSTRUMENT

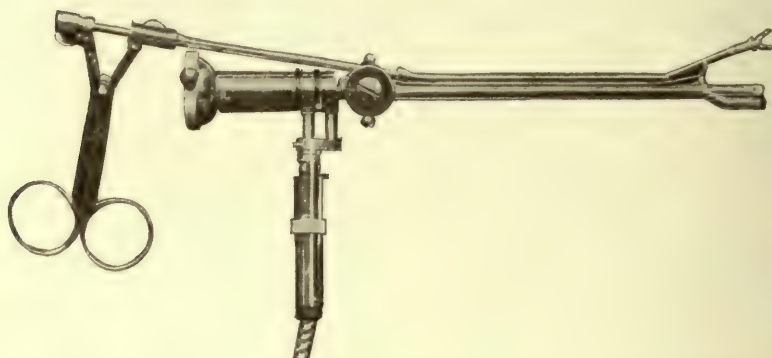
This is a new instrument in ethmoid surgery. It is fenestrated, has great power, is thin when introduced and opens up so as to have a large grasping area. I got this idea of the duck bill when studying with Dr. Luc of Paris. I have seen an operator fail in the Mosher operation to remove the ethmoid because he could not open the grasping instrument he was using wide enough to grasp after introduction after passing the anterior spine of the maxillary bone. It can be used also in removing soft polypi, etc.

AN OPERATING EUSTATIOSCOPE

MYRON METZENBAUM, F.R.C.S., M.D.

CLEVELAND

This instrument consists of an attachment which can be mounted on a Holmes or Bryant pharyngoscope, forming a metallic tube through which flexible operating instruments may be passed. At the end of the tube is an adjustable movable stage which directs the instrument toward the eustachian tube and a



Operating Eustatioscope devised by Dr. Myron Metzenbaum, Cleveland, Ohio.

thumb regulator on the outside for moving the stage. The operating instruments are small biting forceps and scissors on flexible shafts which are readily bent and accurately directed toward the eustachian orifice by the movable stage. The instrument enables operations to be performed around the tube under vision. Adhesions can be cut, granulation tissue removed from the mouth of the tube, polyps, other small growths and specimens for examination can be accurately excised.

 TONSIL SCISSORS

FRANK G. MURPHY, M.D.

MASON CITY, IA.

To those of you who care to try the operation for circumcision of the tonsils, I should like to show an instrument which is used in the following manner :

After the field of operation has been anesthetized the forward blade of the scissors is inserted behind the plica between the anterior pillar and the tonsil, the incision being made as deep as possible.



Tonsil Scissors.

The tonsil is then grasped with a pair of tonsil forceps. As gentle traction is being made with the forceps, any attachments which there may be are severed. Adhesions in the supratonsillar fossa are then cut. The anterior fossa is then dissected farther back so that the tonsil, when the operation is completed, is attached only to the aponeurosis.

AN ELECTRIC COLOR FINDER

TO BE USED IN MAPPING OUT THE VISUAL FIELD AND BLIND SPOT

F. PHINIZY CALHOUN, A.B., M.D.

ATLANTA, GA.

While I am not an advocate of electrically illuminated test objects in preference to the ordinary methods now used in mapping out the visual field and the blind spot, I believe such devices have their field of usefulness and can often be employed to advantage. For example, in office or dispensary work on dark days or in the evenings, and bedside examinations in poorly illuminated rooms or wards. To meet such requirements I have devised, and used for nearly two years, an illuminated color finder patterned after the very excellent and well-known instrument of Dr. Clifford Walker of Boston.

The instrument is about 10 inches long, the head of which contains four perfect colors (white, blue, red and green), made in thin paper and protected by layers of glass, arranged on a slide which is controlled by a thumb guide placed out of the way near the handle. The thumb guide brings into view any one of

the colored discs which is illuminated by a miniature frosted lamp placed behind the color slide and supplied by a hand battery (or a rheostat attachment). There is an additional slide which fits on the face of the instrument and contains a 1, 2 or 3 mm. opening. The entire exterior is painted dull black and appears neat.

I am indebted to N. B. Meyrowitz of New York, makers of the instrument, for their suggestions in its perfection.

A SANITARY CHIN SUPPORT

GEORGE W. SPOHN, M.D.

ELKHART, IND.

I have here a sanitary chin support. We all know the success of an operation in rhinology depends on whether the patient is able to breathe through the nose after we are through operating.

Front and side views.



Sanitary chin support.

I will just show you how this works. There are two sizes of this instrument. This goes, of course, on the clothing and holds the chin up. Any person can sleep very nicely with it, besides it

Front, as worn.



No inconvenience.

Back, as worn.



Perfect adjustment.

How it holds up the chin.



Correct breathing.

is sanitary, and does the work for which it is intended better than any device on the market.

A NEW TONSIL KNIFE

H. V. DUTROW, M.D.

DAYTON, O.

I have here, what might well be termed, a new tonsil knife. A description, together with a cut of the instrument, was published in the *Ohio State Medical Journal* over a year ago, but the instrument at that time was improperly constructed by the manufacturer and therefore was not practicable. This knife was worked out by Dr. D. F. Reeder of Ancon Hospital, Canal Zone, Panama, and myself during our term of service with the United States government, in the eye, ear, nose and throat department of that institution.

The desire for such an instrument came about at the time which might well be termed the evolution in tonsil surgery, that is, the substitution of tonsillectomy for tonsillotomy. We were more



Tonsil Knife.

than 2,000 miles from medical centers, and had read of Dr. Ballenger's sharp dissection method with scalpels and various other methods of complete enucleation. A Ballenger's knife was procured but was not entirely satisfactory in that we felt the need of a concave cutting edge more than a convex; hence the double-edged knife as shown by the accompanying cut.

With this instrument it is possible to remove completely by sharp dissection every type of tonsil that we encounter. It is especially serviceable in delivering from its bed a completely submerged tonsil by dissecting back the mucous membrane and pillars overlying the tonsil, thereby preserving every vestige of mucus membrane which is so valuable in covering the fossa and reducing the amount of scar tissue.

The knife is especially valuable when used in conjunction with the snare. I very rarely, if ever, do a tonsillectomy by dissection alone. After the mucous membrane and pillars have been separated and the upper lobe of the tonsil freed from its fossa, the snare wire is thrown around the pedicle and the enucleation completed.

It is also possible with this knife to do all the separation necessary without the use of any other knives or blunt dissectors. The end of the handle is constructed in such a way that it may be used where the stripping back of the mucous membrane and pillars is desired or any blunt separation is required. If in any case the operator desires not to use the convex edge of the knife, and if he strikes the patient's lip or palate, cutting them, he may dull this edge or grind it down to avoid this unpleasant feature, using only the concave edge for this operative procedure.

In removing the left tonsil I prefer to stand on the patient's right and change position to the other side in removing the right tonsil.

OBITUARY NOTICES

DR. WILLIAM LINCOLN BALLENGER, Chicago, died December the twenty-second, nineteen hundred and fifteen.

Dr. Ballenger was an untiring worker for the benefit of his patients and the elevation of Oto-Laryngology. Many criticisms were made as to his radicalism and surgical activities, yet these very efforts have developed numerous advances in the surgery of Oto-Laryngology.

One of the great "strikes" of Dr. Ballenger was the perfection of the Swivel Knife for the submucous resection of the cartilaginous portion of the nasal septum. The operation was certainly made very much more popular and even possible in the hands of the novice. He was one of the first thorough tonsil operators in this country and for that matter anywhere, and while the operation was not a perfect one, it was a step in that direction. The popularization of the Sluder operation on the tonsil was unquestionably due to Dr. Ballenger, who demonstrated the feasibility of what others claimed to be impossible.

For the removal of the ethmoidal labyrinth in toto with the middle turbinate he devised knives for this special purpose which, though never becoming popular, convinced many timid intra-nasal operators of the possibility of cleaning out the ethmoid thoroughly.

The ever readiness to operate at the various clinics and meetings under the most disadvantageous surroundings, for the benefit of his colleagues was one of the very much appreciated qualities of Dr. Ballenger. I could cite many interesting and amusing incidents from these clinics, and I am also sure that the men who saw him perform these operations were benefited a great deal.

Dr. Ballenger tolerated only that which was practical and no matter how intricate and difficult the problem, it was his ever alertness to transform such material into something useful in the practice of Oto-Laryngology.

Dr. Ballenger was a man firm in his convictions and did not change his opinions readily. The many articles on the subject of Oto-Laryngology were finally summed up in his life work, *Diseases of the Nose, Throat, and Ear*, which is considered by the majority as not only the most popular textbook in Oto-Laryngology, but in medicine, at least the tremendous sale of the same would indicate this fact, it being at the present time in its fourth revised edition and already at the end of the supply so that the publishers have requested Dr. Howard Charles Ballenger for the fifth edition.

Dr. Ballenger was born in Economy, Indiana, April 26, 1861, receiving his preliminary education at Earlham College, Richmond, Ind. Graduated in medicine in 1886 from Bellevue Hospital Medical College, New York City. Married Ada Poarch of Richmond, Ind., in 1886. Began the practice of general medicine in Richmond, 1886-93. General practice of medicine at Evanston, Ill., 1893-1895; since 1895 practice limited to Oto-Laryngology.

He was Professor of Otology at the Chicago Eye and Ear College, 1895; lecturer, 1898; assistant professor, 1901; associate professor, 1902. Professor of Otology and Laryngology from 1905 until 1913, Medical Department, University of Illinois.

He served as Secretary of the American Academy of Ophthalmology and Oto-Laryngology in 1899-1902, was its President in 1902-1903 and since then Councilor. Was a member of the Chicago Medical Society; Fellow of International Otological Congress; Chicago Laryngological and Otological Society; American Laryngological Association; American Laryngological, Rhinological and Otological Association (Vice President in 1905), Illinois State Medical Society and the American Medical Association. Was also a fellow in the American College of Surgeons.

Author of two textbooks, the first appearing in 1900 and the second and larger work on Diseases of the Nose, Throat and Ear. Contributed many scientific and clinical articles to medical journals.—(Index of the *Laryngology*.)

HENRY MANNING FISH, M.D., Hahnemann Medical College, Chicago, 1900; aged 62; a Fellow of the American Medical Association and American Academy of Ophthalmology and Oto-Laryngology; a well-known specialist; died at his home in Chicago, December 11, from pneumonia.—(*Journal A. M. A.*)

MARK DELIMON STEVENSON, M.D. Rush Medical College, 1897; a Fellow of the American Medical Association and a member of the American Academy of Ophthalmology and Oto-Laryngology; vice president of the Summit County (Ohio) Medical Society in 1907, and president in 1908; co-editor of *Ophthalmology*; died at his home in Akron, Ohio, May 2, from septicemia, aged 39.—(*Journal A. M. A.*)

DUDLEY SHARPE REYNOLDS, M.D. University of Louisville, Ky., 1868; a Fellow of the American Medical Association and one of the most prominent ophthalmologists of the South; died at his country home near Louisville, February 4, from cerebral hemorrhage, aged 72. He was a native of Bowling Green, Ky., and served during the Civil War as assistant surgeon of U. S. Volunteers; after his graduation and a term of study abroad, he returned to Louisville where he practiced his specialty of diseases of the eye, ear, nose and throat for nearly half a century. From 1874 to 1901, he was professor of ophthalmology and otology and medical jurisprudence in the Hospital College of Medicine, Louisville, and was president of the faculty of the institution from 1891 to 1893. He was surgeon to the Louisville City Hospital from 1872 to 1892 and local surgeon of the Monon System from 1894 to 1899. His society activities included the chairmanship of the Section on Ophthalmology of the American Medical Association in 1880, 1881, the presidency of the Mississippi Valley Medical Association in 1888 and the treasurership from 1899 to 1901. Dr. Reynolds was a specialist of wide reputation and of great skill; a teacher and writer of force and ability, a wise counselor and a man universally beloved and esteemed.—(*Journal A. M. A.*)

CHARLES A. E. LESAGE, M.D. Northwestern University Medical School, Chicago, 1897; a Fellow of the American Medical Association; once president of the Dixon Medical Association and secretary of the Lee County Medical Society, and a specialist on diseases of the eye, ear, nose and throat, of Dixon, Ill.; a member of the staff of the Dixon Public Hospital; died at his home in that city, January 22, aged 42.—(*Journal A. M. A.*)

BENJAMIN GLEESON, M.D. Rush Medical College, 1902; aged 38; a Fellow of the American Medical Association and a member of the American Academy of Ophthalmology and Oto-Laryngology and Æsculapian Society of the Wabash Valley; oculist and aurist to St. Elizabeth's Hospital, Danville, Ill.; oculist to the Chicago and Eastern Illinois Rail-

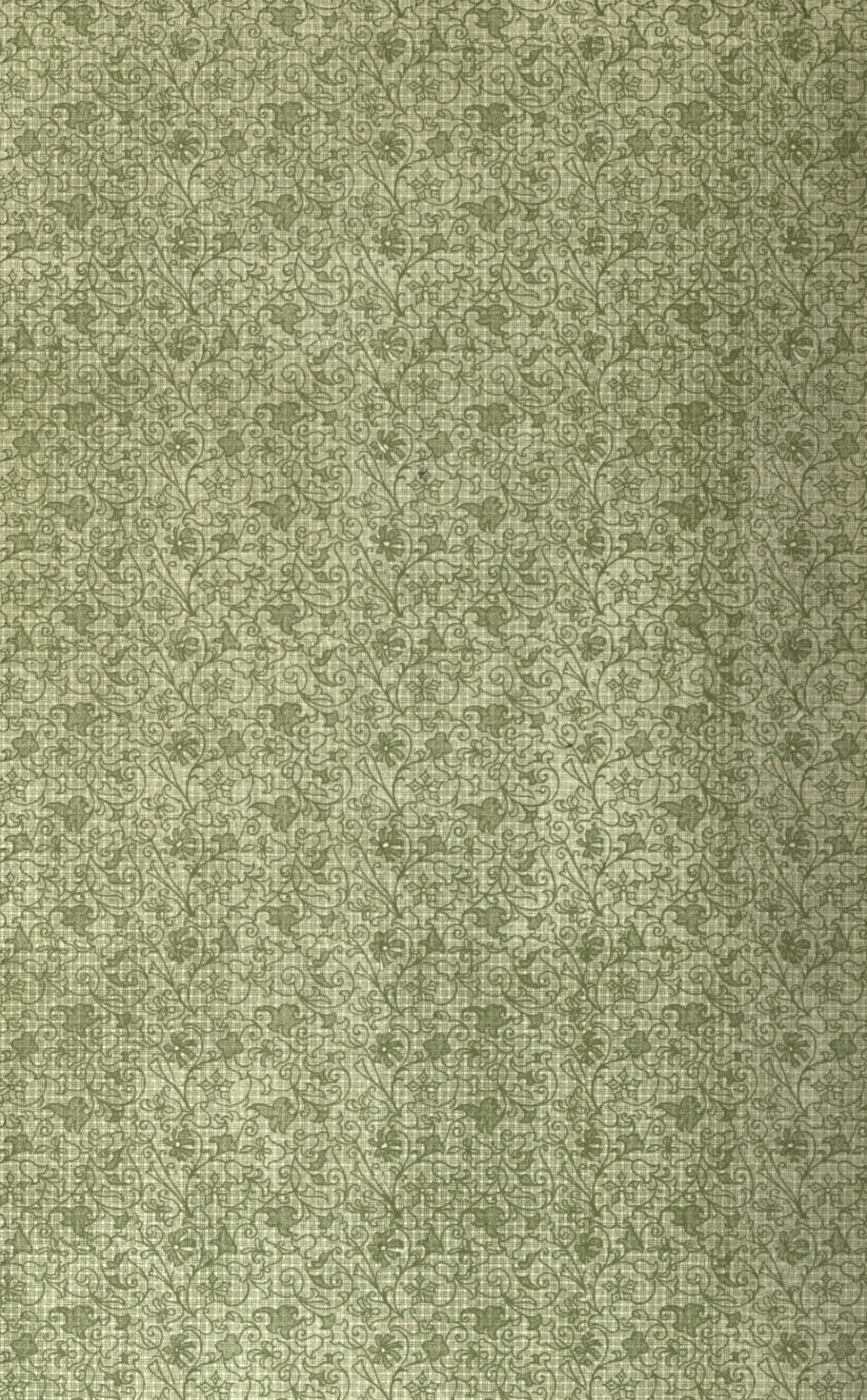
way and the Illinois Traction System; at one time a pharmacist; died at his home in Danville, July 18.—(*Journal A. M. A.*)

FREDERICK ASHFORD GUTHRIE, M.D. Rush Medical College, 1896; a Fellow of the American Medical Association and American Academy of Ophthalmology and Oto-Laryngology; local surgeon for the Illinois Central Railroad at LaSalle, Ill.; a specialist on diseases of the eye, ear, nose and throat; died in the Durand Hospital, Chicago, February 28, from meningitis following diphtheria, aged 42.—(*Journal A. M. A.*)

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